PROCEEDINGS

Sixty-Fourth Annual Convention

OF THE

American Railway Bridge & Building Association

1959

Digitized by the Internet Archive
in 2011 with funding from
University of Illinois Urbana-Champaign

http://www.archive.org/details/proceedingsofann64amer

Proceedings of the

Sixty-Fourth Annual Convention

of the

American Railway
Bridge & Building
Association

Held at

CHICAGO, ILLINOIS

September 15-17, 1959

Published by the Association
Ruth Weggeberg, Secretary
431 So. Dearborn St., Chicago 5

OFFICERS FOR 1959

M. H. Dick.....President
Railway Track & Structures, Chicago

B. M. Stephens.....First Vice-President
Texas & New Orleans, Houston, Tex.

H. D. Curie.....Second Vice-President
Baltimore & Ohio, Garrett, Ind.

G. W. Benson.....Third Vice-President
Central of Georgia, Macon, Ga.

Ruth Weggeberg .....Secretary
431 S. Dearborn St., Chicago

L. C. Winkelhaus.....Treasurer
Chicago & North Western, Chicago

DIRECTORS

Terms Expire 1959

J. M. Lowry, St. Louis Southwestern.....Tyler, Tex.
R. C. Baker, Chicago & Eastern Illinois.....Danville, Ill.

Terms Expire 1960

W. H. Bunge, Missouri Pacific.....St. Louis, Mo.
E. R. Schlaf, Illinois Central.....Chicago, Ill.

Terms Expire 1961

H. A. Matthews, St. Louis-San Francisco.....Amory, Miss.
M. J. Hubbard, Chesapeake & Ohio.....Huntington, W. Va.

Past President

W. H. Huffman, Chicago & North Western.....Chicago, Ill.

OFFICERS FOR 1960

B. M. Stephens ..... President
Texas & New Orleans, Houston, Tex.

H. D. Curie ..... First Vice-President
Baltimore & Ohio, Garrett, Ind.

G. W. Benson ..... Second Vice-President
Central of Georgia, Macon, Ga.

J. M. Lowry ..... Third Vice-President
St. Louis Southwestern, Tyler, Tex.

Ruth Weggeberg ..... Secretary
431 S. Dearborn St., Chicago

L. C. Winkelhaus ..... Treasurer
Chicago & North Western, Chicago

DIRECTORS

Terms Expire 1960

W. H. Bunge, Missouri Pacific ..... St. Louis, Mo.

E. R. Schlaf, Illinois Central ..... Chicago, Ill.

Terms Expire 1961

H. A. Matthews, St. Louis-San Francisco ..... Amory, Miss.

M. J. Hubbard, Chesapeake & Ohio ..... Huntington, W. Va.

Terms Expire 1962

R. C. Baker, Chicago & Eastern Illinois ..... Danville, Ill.

R. H. Miller, Lake Superior & Ishpeming ..... Marquette, Mich.

Past President

M. H. Dick, Railway Track & Structures ..... Chicago, Ill.

TABLE OF CONTENTS

	Page
List of Officers 1959	2
List of Officers 1960	3
Running Account of Convention	7
Abstract of Addresses by:	
M. H. Dick	7
D. J. Russell	15
C. J. Henry	19
Panel Discussion	
B&B Maintenance on the Santa Fe	12
Election of Officers	8
Report of Secretary	10
Report of Treasurer	9
List of Past Officers Since Organization	48
Constitution and By-Laws	53
Directory of Members	58
Life Members	72
Associate Members	78
Membership by Roads	88
Members of Association of Track and Structure Suppliers	112
List of Conventions	114

COMMITTEE REPORTS

Contracting Work in the Bridge and Building Department	37
Effect of Preventive Maintenance on Work Equipment	44
Materials and Methods for Extending the Life of Existing Structures	33
New Materials for Buildings	29
Recent Developments in Fire-Protection Methods	40
Use of Highway-Railway Equipment by B&B Forces	23

INDEX TO ADVERTISERS

Full Pages & Half Pages

American Bridge Div., U. S. Steel Corp.	77
American-Marietta Company	86
Armco Drainage & Metal Products, Inc.	103
Automatic Nut Company	99
Bird & Son, Inc.	101
Byers, A. M. Company	73
Cast Iron Pipe Research Assn.	69

du Pont, E. I. de Nemours & Co. 87
Fairmont Railway Motors, Inc. 71
Hunt, Robert W. Company 105
Jackson Vibrators Inc. 97
Lewis Bolt & Nut Company 107
Linde Company 79
Minnesota Mining & Manufacturing Company 95
Nalco Chemical Company 93
Orton Crane & Shovel Company 85
Patterson, W. W. Company 105
Penetryn System, Inc., The 107
Rails Company, The 81
Rust Oleum Corporation 75
Templeton, Kenly & Co. 75
Torrington Company, The ..... Inside Back Cover
U. S. Borax & Chemical Corp. 83
U. S. Steel Corp., American Bridge Div. 77
Union Metal Mfg. Co., The 89
Wellman Engineering Company, The 91

Engineers' & Contractors' Directory

Arundel Corporation, The 109
Bolton Gunite Contractors, Inc. 109
Cayuga Construction Corporation 109
Codell Construction Company 111
Dickson, J. L. 111
Gillen, E. E. Company 111
Godat, D. W. & Associates 111
Modjeski & Masters 111
Morrison-Knudsen Co., Inc. 111
National Boiler Washing System, Inc. 113
Nielson, S. N. Company 113
Ragnar Benson, Inc. 113
Schneider Construction Co., Inc. 113
Sebastian Corporation 115
Sverdrup & Parcel Engineering Company 115
Talbott Construction Corporation 115

PROCEEDINGS

The Event—The 64th Annual Convention of the Bridge & Building Association
The Time—September 15-17, 1959
The Place—The Conrad Hilton Hotel, Chicago

As has been the practice for several years, the Bridge & Building Association held its 1959 convention concurrently with, although separately from, the Roadmasters and Maintenance of Way Association. Attendance at the two conventions totaled 1,724, including 649 guests and 1,075 railroad men.

A manufacturers' exhibit, held by the Association of Track and Structure Suppliers in connection with the convention, was just one of the many interesting facets of this year's meeting. It consisted of 112 exhibitors.

On the following pages, for the benefit of our members, we have presented, in addition to pertinent information, the six committee reports which were presented at last September's meeting and also excerpts from several major addresses that were also delivered before the group.

Joint Session

The joint opening session convened at 10:00 am on Tuesday, September 15. Those present heard addresses by Mr. D. J. Russell, president, Southern Pacific, and Mr. C. J. Henry, chief engineer, Pennsylvania.

B&B Separate Sessions

At the separate sessions, M. H. Dick, president of the B&B presided, during which time the following committee reports were presented:

Contracting Work in the B&B Department

Effect of Preventive Maintenance on Work Equipment

Materials and Methods for Extending the Life of Existing Structures

New materials for Buildings

Recent Developments in Fire Protection Methods

Use of Highway-Railway Equipment by B&B Forces

A motion picture entitled "The First Five Minutes," was shown on Tuesday afternoon for the benefit of the B&B members by the National Board of Fire Underwriters. The picture depicted the principles of pre-planning for fire control, and showed the latest fire extinguisher techniques.

On Wednesday morning members of the B&B group heard a panel discussion on "B&B Maintenance on the Santa Fe—Inspection, Programming and Mechanization." This discussion was led by C. H. Sandberg, bridge engineer, system, AT&SF, assisted by W. R. Wilson, F. E. Schneider and W. R. Hyma, all assistant engineers in the Santa Fe bridge department.

Remarks by President Dick

Presiding over the B&B meetings, Mr. Dick had the following remarks to say at the opening session.

This has been a year of progress for your association. By that I mean we have registered progress in solving our problems. Financially, the association has been in a squeeze for a number of years. The squeeze has been brought about because membership dues have remained constant at $5 per year since they were raised from $4 ten years ago, whereas other expenses have shown a steady and substantial increase.

To show you how much they have gone up I will recite just a few items of major expense from the treasurer's reports for two years. The first year is the period ending August 31, 1951 and the second is the period ending August 31, 1959. Between these two periods:

Salaries went up from $814.77 to 1448.06, an increase of 78 per cent. Social security and withholding taxes went up from $122.42 to $343.36, an increase of 180 per cent.

Postage went up from $100.47 to $255.00, an increase of 143 per cent.

Stationery and printing, including the Proceedings, went up from $1975.94 to $2890.36, an increase of 47 per cent.

Total expenses went up from $3737.37 to $5719.15, an increase of about 53 per cent.

I hasten to point out that this increase in expense occurred in spite of the most strenuous efforts on the part of the executive committee to hold the costs down.

In view of this increase in expense and the fact that membership dues have remained at $5.00 you might well wonder why the association hasn't gone broke. The answer is very simple; it's because we have more members. Back on September 1, 1951, we had 676 members. Receipts from membership dues in that year came to $2616.00. On the other hand our membership on September 1 this year was 863, and during the past year our receipts from dues came to $3,861.00. That's' been our financial salvation.

This increase in membership has occurred at a steady pace and has taken place as a result of strenuous and persistent efforts of the membership committee. When we consider that the number of eligible prospects for membership is decreasing all the time we can't help but marvel over the achievements of the Membership committee. This year the committee, under the direction of its Chairman Steve Stephens, literally blanketed the country with letters, and came up with a total of 122 new members. He is now known as Dragnet Stephens.

Gentlemen, you have a right to be proud of your association. Year after year it has kept its members abreast of progress in the railway bridge and building field and therefore has served a useful purpose for its members and their railroads. And the need for its services was never greater than right now when developments in the field, particularly with respect to the mechanization of B&B work, are occurring so rapidly.

Now I don't want you to get the idea that the association is on easy street, and that from now on we can coast. Complacency on the part of the officers, and the members, can lead to a slow death. The officers know what has to be done, so I am going to take the liberty of telling you rank-and-file members out there what you can and should do to help strengthen the association and keep it growing.

For you I have this three-point program:

(1) Help bring in new members. How many times has that been said. Probably so many times that it has lost its effect. But the sad fact is that deaths, retirements, and loss of interest are constantly whittling away at our membership. To lick these enemies in the next year all that is necessary is for each of you to bring in just one new member.

(2) Attend these sessions regularly and participate in the discussion of the committee reports. If you don't like what's said in a report, don't just grumble to yourself, get up and speak up. (And incidentally, when you do, please give your name and railroad in a clear voice so our reporters can get your name in the record.)

(3) Volunteer for committee work when you get that post card a little later on. And then when you get your assignment give the chairman any help you can in the preparation of the report.

If every member will put these three points into effect in the coming year this association will have its best year in history.

The new subjects selected, on which the committee reports will be based and presented at the 1960 convention are as follows:

1. Outfit Cars Versus Highway Trailers for B&B Living Quarters.
2. Automatic Heating Plants.
3. Bridge Inspection Procedures by B&B Forces.
4. Application of Prestressed Concrete to Buildings And Bridges.
5. Annual Programming of B&B Work.

In the election of officers in the Bridge & Building Association, B. M. Stephens, assistant to executive vice president, T&NO, Houston, Tex. was promoted from first vice-president to president; H. D. Curie, master carpenter, B&O, Garrett, Ind., was moved up from second vice-president to first vice-president; George W. Benson, division engineer, C of Ga., Macon, Ga., was advanced from third vice-president to second vice-president; and John M. Lowry, chief engineer, SLSW, Tyler, Tex., and a director of the association, was elected third vice-president. L. C. Winkelhaus, retired architectural engineer, C&NW, Chicago, was re-elected treasurer.

New directors elected for three-year terms are R. C. Baker (re-elected), engineer structures, C&EI, Danville, Ill.; and R. H. Miller, maint. engr., LS&I, Marquette, Mich.

TREASURER'S REPORT

SEPTEMBER 1, 1958 TO AUGUST 31, 1959

Cash Balance—September 1, 1958		$1,873.21
RECEIPTS:		
Dues	$3,861.00	
Advertising		
1957 Proceedings	1,040.00	
1958 Proceedings	1,790.00	
Refund from Roadmasters' and M/W Association for 1958 Convention Expenses	667.02	
Sale of Proceedings	3.00	7,361.02
Total Receipts		$9,234.23
DISBURSEMENTS:		
Salaries (Secretary and Assistant)	$1,448.06	
Social Security and Withholding Tax	343.36	
Stationery and Printing	619.60	
Postage	255.00	
Office Rent, Telephone, Electricity	238.48	
Proceedings (1958 Edition)	2,280.76	
1958 Convention Expenses	909.27	
Office Supplies	19.94	
Addressograph Plates	24.25	
Embossing Membership Certificates	43.80	
Miscellaneous	203.65	6,386.17
Cash on hand—August 31, 1959		$2,848.06
BALANCE:		
First National Bank of Chicago, August 31, 1959		$2,848.06

L. C. WINKELHAUS, Treasurer

September 3, 1959
APPROVED:
W. H. BUNGE, *Chairman*
R. E. DOVE
R. P. LUCK
Auditing Committee

REPORT OF AUDITING COMMITTEE

TO MEMBERS OF THE
AMERICAN RAILWAY BRIDGE & BUILDING ASSOCIATION:

Gentlemen:

The undersigned have examined the books of the Secretary and report of the Treasurer for the period from September 1, 1958, to August 31, 1959, inclusive, and have found them to be correct as of the latter date.

Respectfully submitted,
W. H. BUNGE, *Chairman*
R. E. DOVE
R. P. LUCK
Auditing Committee

September 3, 1959—rsw

SECRETARY'S REPORT

ANNUAL REPORT OF MEMBERSHIP FOR PERIOD SEPTEMBER 15, 1958 TO SEPTEMBER 15, 1959

ACTIVE MEMBERSHIP:			
Total Active Members, September 15, 1958		625	
Reinstated—Paid back dues		4	
New Active Members Since September 15, 1958		122	
		751	
LESS—Members reported deceased	3		
Resigned account retirement, etc.	22		
Transferred to Life Membership	10		
Dropped for non-payment of dues (1957)	44		
Transferred from Active to Associate membership	1	80	
TOTAL ACTIVE MEMBERS, SEPTEMBER 15, 1959			671
ASSOCIATE MEMBERS:			
Total Associate Members, September 15, 1958		97	
New Associate Members since September 15, 1958		10	
Transferred from Active to Associate membership		1	
		108	
LESS—Resigned	4		
Dropped for non-payment of dues (1957)	8	12	
TOTAL ASSOCIATE MEMBERS, SEPTEMBER 15, 1959			96
LIFE MEMBERS:			
Total Life Members, September 15, 1958		82	
Transferred from Active Membership		10	
		92	
LESS—Reported deceased		4	
TOTAL LIFE MEMBERS, SEPTEMBER 15, 1959			88
HONORARY MEMBERS:			
Total Honorary Members			8
TOTAL MEMBERSHIP—ALL CLASSES—SEPTEMBER 15, 1959			863

September 15, 1959—rsw

REPORT OF NECROLOGY COMMITTEE

1958—1959

We regret to advise that we have learned of the loss of seven (7) members through death during the year. It is possible that other members have passed away during the year of which we have no information. If you know of any, we would like to have their names to include in the list to be printed in the Annual Proceedings. The following have been reported since our last annual meeting in September, 1958:

NAME	TITLE-RAILROAD	DATE JOINED	DATE DIED
Active Members			
H. G. Erickson	Ch. Engr. Los Angeles Jct. Los Angeles, Calif.	1953	July 21, 1959

R. L. Norton	Asst. Mast. Carp. Seaboard Air Line Jacksonville, Fla.	1951	In 1959
D. E. Perrine	Asst. Ch. Engr. Chgo & West. Indiana Belt Ry. Co. of Chgo. Chicago, Ill.	1953	October, 1958
Life Members			
Peter Aagaard (Ret.)	Supvr. Bldgs. Ill. Cent. Elmhurst, Ill.	1906	In 1958
H. I. Benjamin (Ret.)	V. Ch. Sys.-Comm. on Insurance. Southern Pacific, San Francisco, Calif.	1922	In 1959
Sam Lincoln (Ret.)	Gen. For. B&B. Gulf, Colorado & Santa Fe Beaumont, Tex.	1927	About 1956
F. H. Masters (Ret.)	Spec. Engr. Elgin, Joliet & Eastern Joliet, Ill.	1920	February 7, 1959

We deeply regret the passing of these, our fellow members.

Respectfully submitted,
G. W. Benson, *Chairman*
Necrology Committee

REPORT OF RESOLUTIONS COMMITTEE

The 64th year of the American Railway Bridge & Building Association is nearing the end of a very successful convention, complete with equipment show and a very large registration.

Our principal speakers were outstanding and therefore it is fitting that we recognize the special efforts of all who contributed so much to make this a memorable year.

To this, we propose the following resolution:

BE IT RESOLVED by the American Railway Bridge & Building Association in convention assembled that the thanks of the Association be extended first to Dr. Kenneth Hildebrand, Pastor of the Central Church of Chicago, who invoked the blessing and guidance on the activities of the combined Associations and guests.

BE IT FURTHER RESOLVED, That the thanks of the Association be extended to the Executive officers who honored us with inspiring remarks and counsel, especially to Mr. D. J. Russell, President, Southern Pacific Co., San Francisco, Calif., and to Mr. C. J. Henry, Chief Engineer, Pennsylvania Railroad, Philadelphia, Pa.

BE IT FURTHER RESOLVED, That the sincere thanks of the Association be extended to Mr. F. R. Woolford, President, American Railway Engineering Association; to Mr. A. J. Reading, President, Association of Track & Structure Suppliers; to Mr. Lewis Thomas, Executive Secretary and Director of Exhibits, Association of Track and Structure Suppliers.

BE IT FURTHER RESOLVED, That thanks be extended to C. H. Sandberg, Bridge Engineer System, Santa Fe R.R.; Mr. W. P. Wilson, Mr. F. E. Schneider and Mr. W. R. Hyma, all Assistant Engineers, Bridge Department, Santa Fe Ry., for their very informative discussion on B&B Maintenance on the Santa Fe—Inspection, Programming and Mechanization.

BE IT FURTHER RESOLVED, That the thanks of the Association be extended to Chairmen and Vice Chairmen and members of the several committees for their work in

preparing interesting and instructive reports; and to our President, Mr. M. H. Dick, who has so efficiently directed our activities during this convention year; and to the Conrad Hilton Hotel and staff for splendid co-operation and hospitality shown us during this Convention.

H. A. MATTHEWS, *Chairman*
R. C. BAKER
Resolutions Committee

RESOLUTION HONORS LEWIS THOMAS

The following resolution was adopted at a meeting of the Executive Committee of the American Railway Bridge and Building Association on December 7, 1959.

WHEREAS, Lewis Thomas, a useful citizen and eminent Executive Secretary of the Association of Track and Structure Suppliers, was called from the scene of his earthly labors on October 13, 1959, and his passing has greatly grieved the members of the American Railway Bridge and Building Association;

WHEREAS, these resolutions come from the hearts and minds of men who have associated with Lewis Thomas and who have had the opportunity to know and appraise his unselfish character, ability, and his loyalty to his friends and his work. The many fine things he did for the Association during his lifetime further endeared him to all who came in contact with him;

WHEREAS, Lewis Thomas was a symbol of integrity to his fellow workers and to the general public, a devout gentleman, a loving husband and father; and

WHEREAS, we shall cherish the memory of Lewis Thomas with affectionate feeling and trust that the just tribute of the American Railway Bridge and Building Association will be consoling to his loved ones and will endure as a memorial of an exemplary character. To that end, therefore,

BE IT NOW RESOLVED, that in the passing of Lewis Thomas we have lost a valued friend and the State and community in which he resided one of its outstanding, faithful, and able citizens.

RESOLVED FURTHER, that the American Railway Bridge and Building Association, in meeting assembled, give expression of sympathy to his bereaved loved ones in their great loss and extend to them the heartfelt condolence of those who appreciate their loss.

FURTHER RESOLVED, that these resolutions be spread upon the minutes of the American Railway Bridge and Building Association and that copies thereof be furnished to the members of his family.

B&B Maintenance on Santa Fe Inspection, Programming and Mechanization

The discussion was led off by C. H. Sandberg, bridge engineer, system, AT&SF. He announced that there were a great many B&B problems on the Santa Fe, many of which are common with all other railroads. Also some of the solutions now used on the Santa Fe, he added, were borrowed from other roads.

One of the problems was how to maintain adequate maintenance standards in the face of increasing labor and material costs. He then displayed a graph which showed that in 1934 the number of man-hours expended in B&B were the same as those required in 1958. On the other hand, the graph showed that wages had gone up four times during that period.

He stated that productivity had somewhat increased during the last 25 years but not in the same relation as the cost of labor.

Bridge & Building work, he said, does not lend itself to mechanization in the same manner as does track where out of face work can be done. Nor does it represent the same expenditure. For instance, the Santa Fe spends six times as much on track work as it does on B&B.

At the present time, the Santa Fe has 140 miles of timber trestles with an average age of 38 years. In these bridges, 130

panels were constructed in 1900, and 3330 panels were constructed in 1910. During a 20 year period ending in 1920, an average of 1,000 panels per year were constructed. The average life of the timber bridges on the Santa Fe is about 60 years. If, he added, the life of the bridges was exactly 60 years, 130 panels would have to be constructed in 1960, 1,030 in 1965 and over 3,330 in 1970. Hence, the problem is not only to hold the costs of labor and material in line but also to hold trestle replacements to a minimum. Thus, it is necessary to get the maximum life out of every dollar spent in the forthcoming years.

About two years ago, a survey was made of all of the Santa Fe B&B personnel soliciting their comments toward solving B&B maintenance problems. One of the questions was how much time their forces were spending on various types of work and the answer was that two-thirds of the time was spent on timber bridge maintenance. This pointed to the need for a conference of the B&B supervisors. So, in February of 1959, the conference was held and included B&B inspectors, general foreman, division engineers, bridge engineers and chief engineers. A very frank discussion was held and it was the opinion of management that it was a beneficial meeting.

The men were divided into groups and the chairman of each group reported later on. This permitted frank comments from all individuals at the group discussions without any of the bosses knowing who said what.

Mr. Sandberg stated that the purpose of the meeting was to stimulate thinking and discussion of mutual problems concerning B&B maintenance work so as to improve overall effectiveness. Now, he said, we feel we can take a big step forward in solving our B&B maintenance problems by first getting all the possible life out of our bridges through improved inspection and increased knowledge based on further investigation and testing. And second by increasing the efficiency and productivity of our forces by programming of work, some reorganization of forces and further mechanization.

F. E. Schneider, assistant engineer for the Santa Fe, then added to the discussion. He stated that, while they do not think they have yet all the answers to their problems, they feel they have made a very good beginning.

One of the things that they decided upon in their management talks before the B&B conference, was to evaluate the life of the existing timber trestles.

Using strain gages they analyzed stresses on both open-deck and the ballasted-deck structures.

If a bridge is a candidate for replacement in the next five years, only minimum repairs are made. He then discussed the Santa Fe's inspection methods which include use of inspection tools and the increment borer.

Slides were shown of tests made on good and poor stringers and piles, which were tested to destruction at the laboratory. It was found that the poorest specimen of piling would support 62½ tons before failure.

W. R. Hyma, assistant engineer for the Santa Fe, stated that their survey revealed that the road's B&B gangs were well equipped with small power tools, but lacked the larger and specialized type of tools. The survey also developed the fact that there was need for factual information on actual requirements.

One of their first decisions was to tighten up on their planning and control of bridge replacements. Programming, he said, starts with the bridge inspections. Following the annual inspection, a report is made up of the requirements and each bridge is given a rating. For instance, "A" rating designates the work that must be done next year; "B" is work that is urgent, but can be postponed a year if necessary; "C" is work that should be done within the next five years; and "D" indicates conditions that should be watched, but do not require work in their present state.

From these reports, final estimates are prepared. These show the location priority, an estimate of the cost and the requirements for next year or the next five years. These are then approved by the officers of the grand divisions.

The final step is the complete scheduling of the work. He felt that this was not yet completely satisfactory, nor was it inflexible. However, they feel that this practice leads to better care and utilization of both men and equipment.

One of the things he felt to be most needed were trucks. Another desirable item, he said, is a motor crane with rail dollies for on and off track operation, to be assigned to B&B work on each Grand Division.

With greater mechanization of B&B forces, the road plans to reorganize its labor forces. At present it appears they will have gen-

eral-purpose gangs and all special equipment will be moved from division to division instead of moving the gangs. These gangs will have from six to eight men and two trucks, the latter will permit splitting up forces for taking care of minor jobs, when necessary.

Discussion

When H. L. Van Horn (B&O) asked about the crew quarters that the Santa Fe had on some of their B&B trucks, Mr. Hyma said that they had a removable canopy and the quarters are behind the cab.

F. S. Cheselski (GN) asked if the Santa Fe B&B crews will operate out of a headquarters or will they be floating gangs Mr. Hyma stated that they will live in outfit cars and move over the division. They will have two-men skirmish gangs for small miscellaneous work.

J. F. Warrenfells (Jackson Term.) asked when the Santa Fe renews its timber trestles. Mr. Sandberg stated that they had taken down bridges and found that they had a lot of life left in them. As a result, he continued, they are now double checking on their bridges before they are renewed. They are first inspected and the division forces measure the deflections of the stringers by strain gages. He admitted, however, that renewal of a bridge is still a matter of good judgment.

When E. R. Simmons (Cotton Belt) asked what the difference was in the life of open-deck bridges as compared with ballasted-deck bridges, Mr. Schneider stated that the open-deck required more repairs. The ballasted-deck structures had more serviceable life. However, he continued, it must be taken into consideration that the older open-deck stringers were of the untreated timber, whereas the ballasted-deck structures are of treated timber. The life of the piling is about the same in both types of bridges.

When Mr. Fox asked how long the bridge ties lasted on open-deck bridges, Mr. Sandberg replied ten years. Mr. Fox stated that on his road they had a great deal of fungus growth and they felt that if they got 16 years out of the deck they were doing very good.

C. E. Wachter (CNR) asked if the piling now being used are treated. Mr. Sandberg replied that they are using both the fir and pine piling and some are treated. Frequently, he said, when you bore into a piling you will find a three or four-inch shell, which might give you a false sense of security. It is much better to look below ground for true indications. Yet, he added, if you have three inches of sound shell, the piling is good for carrying a load. But, he again warned, an inspection should be made below ground level.

He has found that some piles will not carry their proper load. To find out why, he dug out a few of the piling at bents and found that the piles were broomed at the middle. When such a thing happens, he said, the bent pile will produce extreme fiber stresses which will exceed the compressive strength on one side, resulting in the brooming effect. R. K. Seals (Sou.) stated that he was forced to replace several caps which were only 15 years old. This could have been caused by the poor timber that was available during the war and also because the caps were pretty close to the ground. They had considerable rot in them.

This prompted Mr. Sandberg to ask the location of the rot. Mr. Seals stated that this occurred in several locations. Some showed a horizontal shear and some a crushing above the piling. Some of these decayed places were quite deep, he added. M. J. Hubbard (C&O) stated that he had some bridge decks which had run 25 years. He thought that this record was very good and attributed it to the treatment.

Mr. Fox stated that he had white oak bridge ties treated. In 90 days the season checks were so wide that white wood could be seen below the treatment. He was sure that in two or three years these ties would show decay.

A member from the Cotton Belt pointed out that ties also fail from traffic use. He had some pine bridge ties which were only 9 years old and the tie plates were cutting in quite deep.

A. B. Wang (Monon) stated that he recommended caulking the seasoning checks and the use of tie pads to get more service life from bridge ties. He uses a sealer coat and a deadener which has worked out very well.

Mr. Fox stated that he used four different kinds of coatings and has found one now that holds gravel quite well. This practice was started to protect the ties from brake-shoe sparks.

E. E. Cash (Camas Prairie) reported that he had some bridges where the ties were still in service although renewed in 1929.

Abstracts of Addresses by Messrs. Russell and Henry as Delivered Before the Opening Joint Session

During the opening joint session on Tuesday, September 15, D. J. Russell, president of the Southern Pacific Company spoke on "The Supervisor's Role in the Future of Railroads." He had the following remarks to make:

I want to touch on two principal and closely related topics today. One is the broad question of the place the railroads can occupy in the future of transportation. The other is the important part you supervisors play in shaping this future of rail transportation.

Let's look at the general picture first.

It is no news to you that our country is expanding in population and industral activity at a faster pace than ever before. I have no doubt that, with continuing scientific progress, our vast natural resources, and the energy and imagination which is given free play under our private enterprise system, this rapid growth will continue. Along with it will go the need for more and more transportation service.

Our gross national product has been increasing at a tremendous rate in the last 12 years. In the 10-year period from 1947 to 1957 it rose from $232 billion to $434 billion—almost double. And it is expected this year to reach somewhere around $467 billion. Economists and forecasters now are predicting a gross national product of over $700 billion in the next 10 years. Fortune magazine flatly predicts $750 billion by 1969. Along with the steady increase in the volume of goods produced, there will of course be a steady rise in traffic to be handled by the various forms of transport.

Recently Dun's Review and Modern Industry magazine, on the basis of its own survey, predicted industrial expansion and population gains will call for a 21% growth in transportation facilities by 1965—only six years from now. While I can't vouch for the exactness of this figure, there is little doubt the trend will be substantial.

The question, then, is how much of this increasing traffic volume the railroad industry will handle. Our job is to make sure that we move not just along with this trend line of national growth, but that we keep ahead of it.

The kinds of transport that will get tomorrow's traffic will be the kinds that can do the various jobs most efficiently. Certainly we can't insist on holding to the rails such traffic as can be moved more efficiently by highway, air or water. But railroads have inherent advantages in basic economy for the mass movement of goods over long distances, which no other form of transport has approached. We can be sure that there will be plenty of traffic to be moved by rail, if only we will seize on every opportunity to continue to increase the efficiency of railroad operations so that these advantages will continue to apply.

This will call for continuing and intensified re-examination of everything we do, to find better ways of doing it. It will require increased research. It will call for seeking out every possible cause of waste, and eliminating it. It will demand of us greater sensitivity to changing consumer needs and preferences, and for the all-out use of our ingenuity in adapting to these changes so as to attract and hold all of the business we can move profitably by rail.

Where other forms of transportation more nearly meet specific consumer needs, we must also make every effort to diversify our services to follow these changing consumer requirements. This involves an attitude of looking upon ourselves as not just in the railroad business, but as ready and willing to broaden out our activities, just as far as we are permitted, in any direction that will serve the public need and return us a net profit.

Presently, of course, we are limited in how far we can go in providing the public with the convenience of a "Transportation Shopping Center." But public opinion is increasingly swinging in support of the idea that we can make our greatest contribution to the forward movement of the whole economy only as we are permitted to do the complete transportation job of which we are capable.

Meanwhile, even within existing restrictions, we are continuing to find many important ways of extending our usefulness in the whole transportation field.

One example of this is the pipe line sys-

tem my own company has constructed from refinery centers in the El Paso, Texas, and Southern California areas into Arizona, and from the San Francisco Bay Area over the Sierra Nevada mountains into Nevada. Here was a case where it was evident that refined petroleum products could be moved more efficiently by pipe line than by rail, and that eventually someone would build such a pipe line. By building it ourselves, we put our right-of-way to an additional use and retained for Southern Pacific this very important traffic which otherwise would have been lost to us.

Piggyback, which is growing so rapidly in importance, is an example of what can be accomplished by use of a little ingenuity in combining the best features of two forms of transport into an entirely new transport form. Here the basic economy of the long haul by rail has been merged with the basic flexibility of the truck at origin and destination, to provide a far better service than either the railroad or truck alone could offer for certain types of traffic. As a result, rails, trucks and the general public all benefit.

Even though we are still restricted from getting into the airline business, we have nevertheless found ways to gear our operations to air transport. Our railroad-owned trucks provide service to and from airports.

To summarize the broader picture of what lies ahead for the railroads and how we must meet these challenges, we come down to these basic points:

With the expected continuing, rapid increase in our national output of goods, more and more transportation services will be needed;

Railroads will share in this increased traffic only if we keep ourselves in the forefront in terms of increasing our efficiency and usefulness under conditions of strenuous competition;

This calls for more intensive use of imagination and ingenuity than ever before, directed toward finding new ways to adapt to constantly changing consumer needs, toward constant seeking for better ways to perform every detail of our operations, and toward elimination of every form of waste;

Finally it comes down to the matter of making a profit. In the last analysis, we can hope to keep out ahead in the competitive parade only as we succeed in turning more and more of our gross into net, so that we can be able to finance the tremendous capital expenditures that will keep us in the running. If there is one single thought I wish to leave with you today, it is this necessity for increasing our net earnings. This is the basic requirement to which everything I am saying relates. It is the fundamental measure of how fast we shall be able to progress and what position we will occupy in the future transportation pattern.

So much, then, for the broad picture. Now I want to turn to some specific thoughts on the tremendous part—the tremendous responsibility—you supervisors have in making it possible for the railroads to meet the challenge facing us.

Whether the railroads will continue as a vital, healthy factor in the American economy, or whether they will become a museum piece, will be determined in large part by how effectively you—and those like you in other phases of railroad work—gear your thinking and your imagination to increasing our efficiency and our net earnings.

You who build and maintain our tracks and structures, and on whom rests the responsibility for judicious expenditure of over $1½ billion annually—1/6 of the total operating money the railroad industry spends—are key people in the job at hand. Certainly you can be proud of the revolutionary advancements that have already been accomplished in mechanizing the work for which you are directly responsible. There is no phase of railroad operations in which technological progress has been more rapid, to eliminate drudgery and back-breaking labor and to get the job done more efficiently and economically.

Yet, I feel sure, the spectacular strides that have been made are only a beginning. Certainly the machines we have today will be further refined and improved, and other machines will be developed to do additional parts of the job. And, as our mechanization progresses, there will continue to be new opportunities to streamline other phases of the work.

Your responsibility for eliminating waste extends all the way from such matters as seeing that lights are not left burning when they are not needed, to a frequent review of common standard drawings to make sure they have not grown unrealistic in terms of prevailing conditions.

Tradition, particularly in an industry as old as ours, can quickly become a millstone around our neck, if we fail to challenge it constantly. For many years, just because there were four holes in each rail joint, we were using four bolts, where on spurs and slow speed sidings two would do the job just as well. Because it was determined that mainline ties should be spaced at 19½ inches, someone in the past, with a passion for uniformity, made this the common standard for all trackage, and as a result hundreds of thousands of ties, tie plates and spikes have been wasted on lighter service trackage where wider spacing would have fully met the requirements. This is particularly so with the heavier weights of rail now used in such cases.

I have no doubt that many of our other practices still follow in some degree traditionally established concepts which, if they ever had any sound basis, are certainly outdated and wasteful now.

Thus you are called on for an attitude of constant alertness. You are called on to develop the habit of looking at every detail of the work, not just from the viewpoint of whether it meets the established standards, but with these more important and ever present questions in your mind: Why must the job be done this particular way, and is there a better way to do it?

The amazing new machines demand of the supervisor a new degree of administrative skill in planning and scheduling the work. It is not enough merely to have a machine that will do the work better and more quickly. Equally important is to be sure that the considerable investment involved is being made to pay off in terms of fullest utilization.

Beyond this, you are called on for a broader understanding of and respect for the purposes of other departments and for coordinating your work with theirs, with the over-all objectives in mind which will most benefit your company. For example, your relationships with the transportation people must be particularly close, so that plans can be made to minimize both train delays and interruptions to track and bridge work. Similarly your relations with the stores, communications, traffic and other departments must be maintained on this same close cooperative basis in all cases where your functions relate to theirs.

While your direct responsibility may not extend to getting rid of industry trackage and other facilities no longer required, certainly your broad responsibility requires that you call these things to the attention of the transportation or traffic people. Getting rid of duplicate facilities or facilities that no longer serve any purpose is one of the most important things we can do to save money.

We should also look particularly for opportunities to save money by re-use of materials. For example, many ties that are no longer serviceable for high speed, heavy tonnage track are perfectly satisfactory for re-use in branch lines and auxiliary tracks.

The new area in maintenance of way technological practices must be matched with progress in supervisory practices. Where yesterday you had labor gangs to do the work, today you are concerned with developing operators of new and complicated equipment. This new era requires a new degree of leadership and a new depth of human understanding.

From this group, under proper guidance, will come the competent supervisors of the future. You will find that from them too, will come many of the ideas that are needed to keep us out in front. Encouraging ideas, in fact, is one of your main opportunities to develop these people. We need to take advantage of all the thinking we can get. Certainly we can't afford to knock down any suggestions that may lead to improvement of our methods.

Many of you here today have learned your skills through the hard school of experience. Others of you have come out of engineering schools. Yet regardless of the amount of formal education you have, you have tended too much to become specialists. The need is for supervisors to broaden themselves to see their work not as a final objective in itself, but in the broad perspective of where the railroads are going and how they can best improve their position in this era of rapid change. My impression is that most supervisors, competent as they may be in the job immediately at hand, have not been sufficiently inclined to expand their interests and understanding into these other fields.

I believe this is just about as true for the college-trained engineer as it is for those who have developed themselves without college training. All too many college engineers tend to concentrate just on engineering.

On Southern Pacific we have recognized that it is a definite part of our management responsibility to broaden out our able people with knowledge and experience in other fields, so they can gain the wider perspective so necessary today. Some 75 to 80 of our officers, supervisors and prospective supervisors are being selected each year for enrollment in various colleges and universities. The great majority of these are fine people who haven't previously had the advantage of college experience. The way they have distinguished themselves on the campuses, in courses ranging all the way from first year studies to advanced management courses, has shown beyond any doubt the high level of ability they possess.

Our educational program was launched in 1950 with a plan under which higher level people, including graduate engineers, were enrolled in advanced management courses at Harvard, Stanford and the University of Houston. It later became apparent however that developing our higher level people served to meet only part of the problem. There was a pressing need to assist and accelerate the development of a much larger group in middle management and below, so as to have available enough able people to move on up the line as positions became vacant.

Thus in 1956 we substantially enlarged our educational program, reaching down through middle management and supervisory levels, and even including some of our carefully selected younger rank and file people who had shown unusual ability.

Specifically, the program embraces a four-week transportation management course at Stanford for our middle management representatives, a semester of regular undergraduate work for our younger people with no previous college experience, up to a year of college work for those needing this additional study to qualify for a degree, and up to two years of technical training for employes doing engineering work but who do not have an engineering degree. Beyond this, we are also continuing and expanding our long established program of sending our higher management people to advanced management courses.

In this entire program, except for the technical engineering courses, the major emphasis is on gaining skill in decision making in the vast range of management problems that call for breadth of knowledge and understanding far beyond the limits of the slide rule or the exact science of calculus. The majority of these "campus railroaders" are studying economics, history, English, philosophy and other subjects in the liberal arts field, with the whole purpose of broadening their experience, interests and human understanding.

All of the people participating in the program—from periods of four weeks to as much as two years—have all their tuition and other expenses paid, in addition to receiving their full salaries.

Some other railroads have programs somewhat similar to ours, but I think there is not nearly enough emphasis generally in our industry on giving people these broadening experiences.

To meet the challenges ahead, we must provide our industry with a continuing supply of able leadership—leadership of a type which can carry us forward under ever-increasing complexity. A supervisor must be alert to the necessity of spotting his bright young people early, and of bringing them along to develop fully the potentials they appear to have. He must constantly strive to instill among his people an attitude of creative enthusiasm, so that they will be encouraged to think beyond the routines of their immediate jobs and contribute their thinking to the over-all progress. He must plan ahead to make sure there will be an able successor to his position.

So I urge you to give a great deal of thought to planning ways of giving your people, from the time they first come to work for you, an increasing and broad understanding of the company and industry, so that they may see how their specific jobs fit in and so that they may establish habits of thinking beyond the confines of the specific things they are doing. It is as much a part of your responsibility to speed the development of your people, as it is to see that they turn out a good record of current performance.

As you provide this guidance and set this pattern for those working under your direction, you will at the same time be preparing yourself to take advantage of the almost unlimited opportunities for advancement which are open to you.

I can tell you that one of the most pressing problems of our industry today is to find

able candidates to step into higher level positions as they become open. We simply don't have nearly enough of the kind of men who have acquired the breadth and judgment and the flexibility and foresight required, ready to move on up the line.

You supervisors represent the principal reservoir from which leaders in our industry must be drawn. Those of you who accept the opportunity, who are willing to put forth the continuing hard effort to gain an increasingly wide overview, will be tomorrow's leaders of our railroad industry. Your futures were never brighter, and I wish you well.

Remarks by C. J. Henry

Following Mr. Russell's address during the same session, the Bridge & Building and the Roadmasters Associations heard an address delivered by C. J. Henry, chief engineer of the Pennsylvania. He had the following comments to make:

The purpose of each American Railroad is to make a profit.

The function of any railroad engineering department, as related to this purpose, is to construct and maintain facilities at costs that will make possible the transportation of freight and passengers at a profit. With labor and material prices increasing at a rate in excess of the increase in gross revenues, the amount available for maintenance expenditures remains almost constant and in some cases becomes less. This economic situation imposes on maintenance engineers the problems of greater production with less personnel, increasing the life of materials, adjusting forces and work methods so that the ratio of maintenance expenditures will be within the limits set by management, and, at the same time, keep the road in proper condition for transportation needs.

I will describe some of the methods we have used to meet the various problems, later illustrate my remarks with pictures, and then if time will permit, try to answer any questions that may occur to you.

First, it was necessary to do something about the time-honored method of performing track work with section and extra gangs. A trial of mechanization was made by equipping a few extra gangs with such modern machines as spike pullers, power jacks, tie removers, tie handlers, scarifiers, tie inserters, rail lifters, tie borers, tie nippers and spikers, ballast distributors, track tampers, tie spacers, track liners and ballast regulators, representing an investment per gang of about $200,000 and manned with 55 men. The results were satisfactory—for example in one district in 1952—72 miles of track were worked with 975,000 man hours using the old conventional methods—in 1957 the same territory was worked by mechanized equipment using 420,000 man hours or a reduction in man hours of about 56%. The quality of the work was better for each, and every tie was given the same uniform tamping.

A second type of gang was organized to take care of a general surface or skin lift. This gang was equipped with power jacks, surfacer, power tamper, power liner and ballast distributor, representing an investment of $80,000 and manned with 16 men. Again the results were satisfactory.

From these trials it was decided to adopt the cycle maintenance principle on The Pennsylvania Railroad and to expand it to System proportions as fast as money for machines and equipment became available. This means tie renewals are made on a six year cycle and intermediate surface lifts made every two or three years as traffic conditions may require. With the exception of certain terminals and yards, all maintenance is now performed in this manner between Philadelphia and Chicago and Pittsburgh and St. Louis. For mobility maintenance gangs are housed in camp cars and are assigned to program work on a district basis.

Each District or former operating Division is equipped with: A heavy maintenance gang; two surface lift gangs; three spot surfacing gangs; two work train gangs; two road crossing gangs; and three skirmish gangs.

The responsibilities of the former section foremen are taken over by the supervisor of track, aided by the required number of track patrolmen, who have the qualifications of a foreman-track and are compensated at that rate. Patrol districts vary in length from 40 to 50 miles and are equipped with track cars or rail-highway auto trucks.

For emergency situations and miscellaneous work, each supervisor is furnished a truck equipped with a hydraulic tail gate, rail saw, power drill, small air compressor, tamping tools and a 14' section of rail drilled at both ends. In the event of a broken rail a 14' section is cut from the rail and replaced with the 14' emergency section, and the

track restored to service. The short lengths are then replaced at convenient times by a self propelled crane equipped with a trailer car.

Each supervisor of track is assigned a welder, a machine operator, a chauffeur, a engineer-work equipment and four trackmen to man the miscellaneous work gangs.

Repairs to road crossings are programmed on a district basis, and the work performed by specially organized and equipped highway crossing gangs.

Skirmish gangs correct intermediate surface and line conditions that may develop between work cycles.

Heavy duty and out of face surface gangs are programmed during winter months for work in yards, right-of-way brush cutting, snow fighting, etc.

In 1952 the average district had a track maintenance force of 1,000 men. Today's mechanized forces total about 350.

The Bridge and Building Department has also been the subject of extensive study, and we now have one region completely mechanized. This equipment consisting of—One rail-highway crane for heavy timber and concrete repairs—one grout machine capable of performing such work as grouting and pressure pointing, shotcreting and sand blasting—one grease machine for spraying bridges, roofs and tie coatings—one aerial tower rail-highway that is used in place of scaffolding to make repairs to buildings and bridges—one pressure spraying assembly used for painting exterior and interior of buildings, applying roof mastics and greases on bridges —one power pack consisting of jacks, drills, saw impact wrench, bolt puller that is used by the timber repair gangs—one unit of staging air operated that is used with the grease machine—one trailer equipped with all small tools necessary for making repairs to buildings. One highway trailer for housing men. This department will be revamped systemwide as fast as equipment can be financed.

The Brotherhood of Maintenance of Way Employes and The Pennsylvania Railroad Labor Department have discussed and negotiated the various phases involved in carrying out the mechanization program.

Since reduced unit costs through increased production is our objective, it was necessary to set up a procedure for obtaining data and distributing the information not only to system and regional officers currently, but down to the supervisors and general foreman responsible for the work. For this purpose a group was selected from maintenance officers and sent to school to study industrial engineering methods. This group developed a code method of reporting the hours expended on 165 items of maintenance work. The date is accumulated currently on I. B. M. machines located at system headquarters, and sent out in report form, each month, to all concerned. Cumulative reports are run off every quarter showing total amounts of work performed, number of hours spent, number of dollars spent for labor on each item and the number of man hours per unit. For example, if it is desired to know the total number of feet of track raised by machines during the first six months of 1959, this report will show 5,496,982 feet—254,625 man hours—$582,-515 spent, and the number of hours expended per unit as .046. The report gives the same data for each region and the problem of keeping a comparative record becomes relatively simple.

The group also make detail studies of methods used in performing the various types of work. Movies are taken and shown at various speeds to determine the manual movements made by operators in the use of machines for the purpose of reducing the number of movements, to speed up production and to reduce the number of persons engaged in the work. The results have been extremely satisfactory, and have resulted in gang reductions, ranging from 10 to 50 per cent, and substantial increases in total production.

Cycle Maintenance methods calls for accurate planning. The initial program is prepared by the supervisor of track, and includes such data as locations by mile post pluses, number of ties required, average lift in inches, number tons of ballast, days required, total cost and unit costs per lineal foot of track. Cost include each item down to and including amortization of machines, predicated on a realistic life or upon actual rental figures. This data is accumulated by the District Engineers for each sub-district and submitted to the Regional Engineer, and they in turn submit to the system office. Each programmed track job has a price tag.

Bridge and Building programs are prepared on a gang basis and include definite

job assignments by dates, estimated expense expenditures, capital expenditures and retirement expenditures and detail list of material requirements by dates and estimated costs.

Cleaning of ballast is of first importance in the proper maintenance of tracks. Ballast is cleaned by company owned ballast cleaners augmented by rented equipment. The ballast cleaners have been developed by The Pennsylvania Railroad over a period of thirty years. Four machines representing an investment of about $1,000,000 clean an average of 1,500 miles of intertrack space and 1,500 miles of shoulder each year at an average unit cost of .05 per foot. The operation of the machines are controlled from System headquarters.

Rail is laid by mechanized gangs of 85 men each. Costs for the past two years have averaged $26. per ton and these costs include delivery of rail, laying of rail, picking up the old rail and other track material, and all costs of owning and maintaining the equipment and machines used in the operation.

Program progress is followed by system officers through the medium of track inspections, track, building and signal supervisors, district engineers, regional engineers and engineers maintenance of way accompany the inspection party over their respective territories four times each year. A machine and a formula is used to grade such subdivision, each trip. Actual unit costs are compared with program estimated costs. The method and cost control boys prepare an annual statement showing miles of track worked, average man hours per mile of track for each sub-division, and its average rating. These inspection trips have demonstrated cycle maintenance methods, have resulted in a more uniform ride and more uniform rating between sub-divisions.

To keep up to date on the various types of machines, we have a Committee composed of twenty men. Each region and each maintenance position is represented. The committee meets every two months. A carefully considered agenda is prepared prior to the meeting. Each member is given a definite assignment and when this group gets through with investigating a machine, system officers have complete data as to its merits.

With the exception of cranes and ballast cleaners all repairs to maintenance machines are made at three strategically located repair shops, by the work equipment engineers and machine operators, who operate the machines during the work seasons.

Our research and test department have been invaluable to us in the development of new ideas and in determining the right materials for the particular job. Some examples of their work have been the development of 133, 140 and the 155 lb. rail sections. A recent review of new rail failures occurring during the ten year period prior to 1946, with the ten year period subsequent to 1946, when the new rail sections were placed in service, shows a 99 per cent improvement.

The specifications for ballast developed only after rigid and exhaustive tests have resulted not only in improved track surface conditions, but in reduced total costs for ballast. Testing is a continuing process—each quarry is tested at least once each year—graded—and used at locations where the rating is suitable for the traffic volume.

The research and tests on tie anti-splitting devices has resulted in use of dowels costing 30¢ per tie, that have definitely increased the life of our ties.

Development of methods by our test department for welding rail ends, surface grinding rails, cropping of rails, reforming of joint bars, electric batteries for lighting switch lamps are a few of the tangibles that have really paid off for us in prolonging the life of rails and in lessening maintenance costs.

Many steel bridges designed fifty to sixty years ago with ratings of Coopers E-50 and less are in need of major repairs or replacement. A careful research and study of electric welding by our Structural Engineers have developed methods for not only repairing, but for strengthening these structures, and the work can be successfully carried on under traffic. The technique of welding has been successfully applied to repairs to ore handling machines.

Excessive dredging costs for maintaining water depths of 38' at our ore and coal docks at Philadelphia have resulted in an extensive study of river currents that cause the silting action. We have a complete scale model of that part of the Delaware River located adjacent to our piers, by the use of water, dye and Gilsonite, it is possible to accurately reproduce river currents and silting action. It is our purpose from this study to develop a break water that will reduce the

accumulation of silt, and lessen our expenditures for dredging.

The success of any mechanization program is dependent on the number of hours the machines can be used. At present most of the equipment is designed for on track use. In multiple track territory this problem is not difficult if the program planning provides for temporary crossovers and block stations placed at strategic locations, and the work scheduled on a two-trick basis, or during hours of minimum traffic flow. Here is a situation that calls for a full and complete understanding between the maintenance, transportation and triffic departments—each must keep in mind "profit" as the common objective, and well maintained track and structures are substantial contributors toward the net of any railroad. Not too long ago M. W. ratios of 15 percent were accepted practice—now 12 percent is being questioned—lower ratios are possible by mechanization provided full utilization of machines is made possible and rail conditions are equal to the needs of traffic volume.

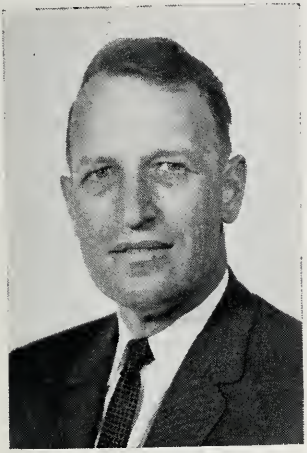
No one organization has a corner on ability or ideas, and it is always desirable to learn what your neighbor is doing. The Form "A" filed with the Interstate Commerce Commission, by each Railroad each year, is an interesting source of information as to what each "road" is spending by maintenance accounts. Comparative statements are worth the time spent in study and analysis, especially when compared with other roads in your district.

The committee meetings of such organizations as the A.R.E.A., the Roadmasters Association, The Bridge & Building Association, the American Society of Civil Engineers are all sources of new ideas and exchange of work methods.

Use of Highway-Railway Equipment by B&B Forces

Report of Committee

COMMITTEE—A. W. Carlson, *Chairman*, engr. of br. & struct., WP. San Francisco, Calif.; R. W. Humphreys, *Vice-Chairman,* off. engr., NP, St. Paul, Minn.; B. L. Pritchard, *Vice-Chairman*, gen. fore. b & b.-w.s., P&SF, Amarillo, Tex.; H. L. Chamberlain, supv. struct., PRR, Indianapolis, Ind.; G. S. Crites, div. engr. (ret.), B&O, Baltimore, Md.; J. E. Griffith, asst. ch. engr. m.w.&s., SOU., Knoxville, Tenn.; H. O. Jackson, b. & b. supv., GN, Grand Forks, N. D.; W. R. Meeks, b. & b. supv., MP, Falls City, Nebr.; G. A. Moser, b. & b. supv., SN&TS, Sacramento, Calif.; K. Overdits, asst. engr., NYC, Chicago, Ill.; V. D. Raessler, supv. b. & b., IC, Memphis, Tenn.; J. F. Watkins, b. & b. supv., GS&F, Valdosta, Ga.; G. R. Webber, b. & b. fore., CMStP&P, Tacoma, Wash.; R. C. Weller, div. engr., CNR, London, Ont., Can.; H. M. Wilson, asst. supv. struct., PRR, Chicago, Ill.; R. A. Youngblood, proc. supt. b. & b., C of Ga., Savannah, Ga.



A. W. Carlson
Chairman

The new concept of all branches of railroad maintenance of way in recent years is to analyze the work practices and, as far as possible, to completely mechanize all operations. And with this mechanization comes the need for operation of this equipment not only on the rails but on adjacent highways or on railroad constructed roads on the right of way. The bridge and building department is especially adaptable to mechanization and the operation of highway-railway equipment. And, as a result, the first mechanization on most railroads was accomplished by the B&B group, in acquiring trucks, cranes, compressors and similar equipment. This practice has continued on all roads, and as a consequence most B&B Departments have a large variety of machines and equipment and utilize a great many mechanized work practices.

This committee surveyed many properties throughout the country to determine the latest thinking on the factors influencing highway-railway equipment and mechanization. Aspects of the subject studied included the methods used in determining the type of mechanization and programs, the latest types, kind and sizes of equipment now available to B&B forces, and finally, the use and advantages of highway-railway equipment and mechanization versus old conventional methods.

Among the factors influencing the need for new equipment and methods, the most important is the ever-rising costs of material and the need for most efficient use of labor. In an economy which has recently experienced a steady inflationary rise of 2 per cent to 3 per cent per year and which is forcasted to continue for the next two decades, work methods for the most economical use of labor and materials becomes imperative. Work forces must be made efficient and economical and their capabilities increased in performing the tasks required. This can only be accomplished by utilizing the most efficient tools available, whether they be small power tools or larger items of mechanized equipment, and then tailoring the manpower to make best use of the tools. Proper use of materials, of course, must be considered, and changing design concepts may reveal many new materials that will result in overall efficiency and economy.

Another factor that may dictate the use of equipment that can operate off-track is the railroad's requirement to compete servicewise by running fast and frequent trains so that occupancy of the rails by B&B work equipment becomes a problem. The curtailment of passenger trains and work trains

on every railroad has resulted in the need for other ways to transport men from job to job and with limited train service, manpower and material deliveries must be programmed. In many cases, other methods of transportation than rail service must be used for transportation to various scattered work sites.

Another factor influencing B&B equipment and methods is the recent overall need of highway and off-track roads by the larger track forces and other maintenance groups. This has resulted in the construction of additional entrance roads to many track structures and in the construction of private roads parallel to track on railroad right of way. This has benefited the B&B departments so that they can transport their machines, tools and equipment, together with forces, directly to structure sites.

The final factors influencing the change in B&B methods is the continuing development and improvement of existing and new machines, tools and equipment. The continued development of new processes, metals, alloys, electronic controls and other techniques will enable the manufacturers to continually supply the B&B departments with new tools, machines and methods. True, many of the machines or improvements are developed on individual railroads, but the big push to acquiring new and better things is greatly promoted by the manufacturers of these items.

Having considered the factors of need for mechanized tools and equipment, the next question is, how are requirements determined on individual railroads? Obviously, the equipment that performs satisfactorily on one property may be unsatisfactory on another because of weather, terrain, labor contracts or many other factors. Therefore, a program for achieving optimum mechanization and efficiency cannot be adequately covered in detail. However, broad principles on how it has been and is being accomplished successfully on many properties can be set forth.

On small properties the individual charged with maintenance programs can usually, after preliminary discussions with subordinates and field supervisors and after a few field trips to observe equipment, select the proper equipment and the methods for its use. On other roads, a committee of officers and field supervisors develops the basic information and after study recommends a course of action to the management for approval. In fact, on some large properties this committee arrangement is permanently established and makes continual recommendations for new equipment and improved methods.

An outstanding example of this is a committee formed on a large mid-western railroad. The committee was formed two years ago and made several trips to various parts of the country to observe new equipment and methods on other railroads, in other industries, and manufacturing plants. The committee presented an integrated report on new equipment and how it could be fitted into the road's particular organization. This resulted in the mechanization of the entire B&B operation at a reasonable cost with attractive savings. This particular committee found that in some cases where railroads had recently purchased equipment, there was an equally effective machine of different make in the building or allied industry, which could be purchased cheaper.

Some of the basic criteria to be determined by the individual or committee charged with the selection of any equipment would be: Can we afford to purchase it? Can we use labor more efficiently to justify its initial cost? Can more work be accomplished with it? Can labor be freed for other work or will no additional labor have to be hired if it is purchased? These and similar pertinent questions must be evaluated before the purchase of any piece of equipment. Maintenance officers armed with the above and similar facts in a comprehensive factual report are in a good position to receive wholehearted support from top management.

With methods of determination of what equipment and machines to purchase, what are the types, kinds and sizes and methods of use of this equipment. This committee's survey of the roads may not have covered the entire field, but a good cross-section of what is the latest and adaptable to the B&B departments is given in this report.

Among the first equipment acquired by B&B gangs were rubber-tired trucks. Today truck use on all railroads has been greatly expanded so that every type and size of truck from one-half-ton pickups to three-ton multi-use vehicles are generally used and newer types are being adopted every day. The smaller one-half-ton to one-ton vehicles are generally used by small one or two-man gangs such as traveling carpenter, welding, water service or paint gangs. They are equipped with stake or other suitable type body, flanged wheels in many cases, small hydraulic or other type hoist, if necessary, and compartments for tools. In some cases provision is made for carrying a push car

or light motor car. These trucks can either be supplied by railroad specialty manufacturers or automotive manufacturers.

The common one-and-one-half to two-ton types are being used by general purpose gangs and some specialty gangs such as steel, timber and paint outfits. This type of vehicle is also equipped with flanged wheels, and if necessary, winches mounted on the front or rear, "A"-frame or hydraulic boom arrangement, covered compartment and seats for hauling crews, space for tools and other equipment. These trucks and those given below can be used in conjunction with heavy-duty rubber-tired pole-type trailers, thus providing excellent methods for transporting long material to any jobs sites.

The larger two to three-ton trucks, especially the two-and-one-half ton, are being used by many roads not only as general-purpose gang trucks, but also for mounting hydraulic aerial booms and baskets with tools for paint gangs, also for trucks to be used as a crane with long expansible boom, with power plant and winch such as would be used by timber gangs and others. These trucks also can operate as highway-railway units with the addition of flanged wheels. A southern railroad has been particularly successful in using this highway-railway equipment.

One far-northern railroad in the survey had a particularly interesting application of this heavier type truck. It recently purchased a three-ton truck equipped with a second four-man cab in the back of the front cab, three-ton winch, 7-ft. by 13-ft. dump stake body on the rear, a 10-ton hoist for lifting and other equipment. The seven man gang, with necessary small mechanical tools and this truck, is completely self-contained and equipped for any type of B&B work, and is operative in a radius of 40 to 50 miles from the center of a large railroad terminal, which has a great many maintenance facilities. The truck was in the $7,000 price range, and projected annual savings were approximately one-third of the initial investment.

The combination of accessories and adaptation of vehicles to various situations in mechanization were varied, but the general range and utilization by all railroads as investigated in this survey were as given above.

The cranes or hoists were similarly varied and generally ranged in size from one-and-one-half tons to 25 tons lifting capacity. The rail-bound so-called one-and-one-half-ton "crab" car equipped in most cases, with a motor-operated hoist was common to all railroads in the survey. Also, there are the familiar 5-ton track cranes and the heavier rail-bound standard cranes up to 50 tons capacity where pile driving is involved and handling of steel and concrete members for structures on the different properties.

The newer trend is to adapt to railroad uses the pneumatic-tired highway-type cranes and hoists and these are, in many cases, equipped with flange wheels. In the one-and one-half to two-ton capacity range "A" frames or short hydraulic booms are mounted on rear of conventional trucks as stated earlier. In the 5 to 8-ton capacity range, cranes can be equipped with booms 25 ft. to 35 ft. in length for handling long timber stringers, and can be used in conjunction with hydraulic jacking tools and similar equipment. These cranes are available in the rear-end truck-mounted type or the self-propelled four-wheel-drive hoist type. Either can be equipped with hydraulic outriggers, retractable guide wheels and other equipment.

There are many types of truck cranes and self-propelled hoists produced by automotive, railroad and other equipment manufacturers. A recent railroad equipment committee, through investigation, found other makes of equipment in this field which were considerably cheaper than the types currently being used by some roads. The cranes and hoists in this category are very mobile and operate well on the rails and over the highways.

In the heavier truck cranes of 10 to 25 tons capacity, there are available a large selection and the particular size selected for use on any property is dependent on the use intended. If it is to work as a digging tool for excavating foundations, whether it is to be used as a pile driver or if it is to lift such members as precast concrete also whether it is to be used by other departments or will be required to travel long distances between jobs, these and many other requirements are the factors in determining the size and kind.

However, from the survey of the railroads, a 10-ton rubber-tired truck crane seemed to be preferred. It was light, could travel well and also was sufficiently heavy to handle shovel work, light pile driving jobs and trestle work, and it can also be obtained with flanged rail wheels.

In the heavier cranes where use is limited, and if they are needed for any particular work, they were usually rented with an operator for the particular job. On railroads

where other maintenance groups use cranes and shovels, they are borrowed by the B&B groups when necessary for installing pipes under tracks handling steel girders, driving piles and similar work.

Combination machines are available and are being used by some railroads. These include the small farm-type tractors, some with flanged wheels equipped with digging buckets, auger, dozer blades and boom. These machines are relatively inexpensive and can be provided to gangs where the higher cost crane or shovel is not justified.

Crawler-type tractors ranging in size from 50 hp to 130 hp are available on most railroads, and they can be used by B&B gangs for progressing bridge and ditch filling and as necessary.

Self-propelled trenchers and like equipment are owned and used by most water service and related departments on the railroad.

Self-propelled and rubber-tired trailer-type air compressors are available, and usually range from 85 to 600 cfm in size. The self-propelled types are in many cases equipped with retractable flanged-type rail-wheels.

There are available various type of self-propelled rail-bound machines, such as bridge greasing or painting machines, gravel distributors and a bridge-decking machine which drills holes, drives bolts, spikes and propells saws and wrenches.

On all railroads there are, according to the survey, the usual rubber-tired mounted concrete mixers, pumpcrete machines and similar equipment. One western road has combined these machines to completely mechanize concrete tunnel pouring operations from the crane handling the material to depositing concrete in the forms.

Now that the large machines and equipment have been covered, there are many accessories that are combined with these machines and also used separately. Probably one of the most significant is the hydraulic power set as developed by a southeastern railroad and currently manufactured by a railroad manufacturer. It is a central hydraulic power unit from which special jacks, bolt cutters, bolt pullers, saws, impact wrenches and drills can operate. These tools are usually worked in connection with a highway-railway hydraulic operated crane, mounted on a truck.

Aerial booms equipped with baskets, paint drum containers and spray equipment are used by many roads and mounted on rear of highway-railway trucks for painting of all types of structures. In connection with painting, not only is sand blasting equipment and paint spraying equipment provided, but spider staging of all types is being used by many roads.

To fill out these mechanized gangs—small tools, such as air, electric, or hydraulic actuated saws, drills, wrenches, busters, hammers, and similar equipment, are required to fit the particular need of the general purpose or specialty operation. There are many sizes and kinds and this choice is up to the individual supervisors. However, tools are not mixed. For example, a gang has a hydraulic power-pack unit or a high frequency generator plant, all tools, saws, wrenches, and drills, should be geared for these plants. Similarly, if a gang has an air compressor, tools should be air driven. A similarity of all tools on a railroad will simplify the maintenance and inventory of repair parts.

Some of the specific uses of highway-railway equipment versus conventional methods are as follows: In changing ties on a steel bridge with conventional hand operated equipment the method in which the renewal ties are brought out on a push car and installed by hand-cranked rail-bound-crab-car is extremely slow. On the other hand the mobile highway-railway crane is moved out on the bridge and new ties are picked up and swung around and inserted into deck quickly. It is known that under the old hand method that approximately 10 to 15 ties are installed in a day, depending on traffic, while under mechanized operation some 80 to 160 ties are installed.

Consider the work done on timber trestle decks, particularly with regard to stringers and caps with the mechanized equipment versus the old conventional hand method. Under the mechanized method of doing this operation with the help of highway-railway crane, the hydraulic power jacks are installed under the deck, the deck is raised and with the hydraulic tool, the bolts are cut and the cap is quickly removed. This can be accomplished in a matter of a few minutes, whereas the tedious process of hand jacking would occupy several hours to complete this operation. The same is true with changing out stringers as with the caps.

Now consider painting with mechanized equipment versus old method. With the mechanized aerial booms and other accessories a majority of the over-all time formerly required to construct scaffolding is eliminated. This is particularly true of the

painting of the exteriors and interiors of high buildings and the superstructures of bridges. The overall production of mechanized painting or greasing gangs versus the use of conventional scaffolding and hand painting is in the range of approximately two to four times as efficient.

With reference to mechanized pile driving versus use of conventional track driver, many railroads under the present train operation schedules are experiencing difficulty in obtaining sufficient time on the tracks for these track drivers to perform driving operations in an economical manner. It is quite likely in some cases that the pile driving crew will be given sufficient time for only one or two piles a day. With the highway-railway crane, this gang makes efficient use of very short periods of track time. This is occasioned by the fact that the crane with the pile-driving equipment is ready for immediate operation and immediate cessation of operation when such times are afforded by the dispatcher. There is no necessity to run in many cases several miles to the closest spur or siding nor is there any necessity for constructing a new spur. It can be seen from this that the efficiency of pile driving can be improved many fold by the use of this type of equipment.

The conventional method for hauling men and material to job sites has always been by means of motor cars or push cars. This involves on the majority of railroads, the necessity for long-distance travel over the rails, and such traveling involves the problems of operation under train traffic and is subject to restrictions of the operating department's rules. With the highway-railway the greater part of this distance can be made on existing highways and roads in one-quarter of the time and if necessary in inaccessible areas the equipment can then get on the track and travel a relatively short distance to the job site.

Highway-railway equipment also has advantages when used on wharf and building work. For example, a highway-railway crane can redrive piling, renew decking and accomplish the complete job, and also be available when not doing this work for a variety of other kind of repairs. Whereas if this equipment was not available, conventional skid drivers or water-borne driver equipment would on many railroads be only used for this specialized job.

The use and comparisons could be expanded to every machine and operation both for the largest and the smallest tools. The examples given above represent only a few old methods versus new methods and the principles can be applied to any situation.

It must be remembered that the use of a large, expensive machine is relative to size of gang or project, and must be geared so that it is used all or most of the year. If this is not possible, the use of smaller equipment is dictated, unless the larger machine can be shared with another department. On certain railroads, the renting of the machine while it is needed is more economical. Some roads have continual work requirement to fully utilize the capacities of the largest equipment described above. Others do not.

The logical solution for utilization of highway-railway equipment by the average railroad seems to be as follows: Every major gang through the system should be assigned an all-purpose truck which, in addition to having comfortable and sufficient crew space, will be equipped with a small crane, compartments for tools and accessories, flanged guide wheels, and winches. At centrally located points there should be larger equipment, such as heavy cranes, large compressors, ditchers, etc., accessible for use by all the gangs when their particular work requires heavier machines. The use of the large mobile tools can be programmed by the supervisor having jurisdiction over the gangs since he is in a position to know the needs and requirements of the work involved.

The advantages to be gained are many. Railroads with six to eight men, plus foreman, for general purpose and specialty gangs, and one foreman and from three to four men for paint gangs, with two-man gangs furnishing the needs for many jobs under a mobile mechanized system are common for this new type of operation according to this committee survey. Highway-railway equipment and mechanized gangs can cover a large territory, work on several projects at once and still do a better and more efficient job compared to conventional methods of gangs bound to the rails. With greater mobility, the men become stable, high-caliber family men, operating from a central point. Comfortable camp trailers of any size from one to ten-man capacity can be provided at job site compared to usually inadequate railbound outfit cars.

With greater mechanization, a project can

be performed more quickly, thus cutting down the length of slow orders on the track. With less occupancy of track by conventional motor cars and with off-track equipment, the tracks can be turned over more to the business of hauling trains. Projects can be better programmed because the gang foreman can get to his job and spread his forces to various sites to accomplish his objective. Bulk material can be brought in by rail and trailers, but the multitude of small accessories and materials to complete any job can be accumulated by truck if the gang is completely mobile.

There are undoubtedly many other advantages too numerous to mention, but the overall objective accomplished is to see that the maintenance of way ratio in B&B work is decisively cut in face of rising prices without hindering train operations.

And in conclusion, all of us continually increase our knowledge of the tremendous strides made in our nation's economy and in its technical progress. While the spotlight is, of course, on the technical progress in the field of electronics, aviation and rocketry, we all know that some of the processes and techniques and material developed for use in these industries can be applied to other fields of activity which are a little further from the spotlight, and this the railroad specialty manufacturers *should* be on the alert to adopt to practical railroad uses.

New alloys, new metals, manufacturing and inspection processes make available new tools which can be applied to our needs. Through our own trade publications we are observing that the railway supply manufacturers are offering many new tools for our use. We can be sure that the industry will continue to progress in this regard.

An analysis of the railroad industry in America will show that new machines, not only in maintenance of way, but in other departments as well, have kept the railroads solvent and have actually insured the jobs of the many thousands of us who earn our living in the railroad industry. Certainly the mechanization that has taken place in maintenance of way generally and in the B&B departments in particular has contributed a good share to the overall present efficiency of railroad operations. We all know that further mechanization is coming and it certainly behooves us as B&B supervisors, to be ready to accept and further the use of this machinery.

Some of us in thinking of mechanization perhaps allow our minds to dwell on the spectacular machines, such as heavy cranes, hydraulic lifts, heavy pile drivers, etc. However, a moment's thought will show that some of the less spectacular machines, such as lightweight jacks, power saws, air wrenches etc., have contributed a great share to the efficiency of our work and, if you will, to mechanization.

All of us, as members of the large railroad industry, and as members of the B&B departments of our individual railroads, should certainly train ourselves to be on the alert for the adoption of new methods, new machinery, new materials, new tools and new work organizations in order to make our work more efficient than it now is. Thus, we will in our own way be contributing to the industry and our companies and, further, we will be making our own job easier and more efficient.

New Materials for Buildings

Report of Committee

COMMITTEE—G. F. PRUDE, *Chairman*, supv. b. & b. T&NO, Houston, Tex.; J. T. SCHOENER, asst. engr. struct., MP, St. Louis, Mo.; W. E. BUGBEE, prop., W. E. BUGBEE, San Antonio Tex.; W. M. CAMERON, ch. carp., CMStP&P, Milwaukee, Wis.; C. M. CRAWFORD, engr. insp., UP, Cheyenne, Wyo.; G. FRITZINGER, asst. engr., WABASH, St. Louis, Mo.; W. F. HERBERT, asst. supv. struct., PRR, Buffalo, N. Y.; O. P. OLSON, b. & b. supv., C&NW, Chicago, Ill.; L. B. RASMUSSEN, supv. struct., WT, Washington, D. C.; P. E. SCITES, asst. supv. b. & b., C&O, Huntington, W. Va.; L. L. SELEY, mast. carp., CB&Q, Hannibal, Mo.; JOHN E. SCROGGS, mgr. r.r. dept., CARTER-WATERS, Kansas City, Mo.; G. H. THATCHER, JR., asst. engr., C&NW, Boone, Iowa; S. C. WALKER, supv. struct., PRR, Philadelphia, Pa.; A. H. WEEKS, b. & b. insp., NYC, Watertown, N. Y.

G. F. PRUDE
Chairman

In recent years there have been a considerable number of new developments in materials applicable to railway buildings. To cover all these adequately would require a report of excessive length. For this reason the committee decided to confiine its report to a number of what it considers the more important developments. These include the types of concrete roof and floor slabs now available, prestressed concrete, recent developments in paint products and plastic pipe.

Concrete Roof and Floor Slabs

Though precast concrete is not new to railroad men, recent developments have created a change so great in the application of precast concrete that the material itself must be treated as new in character in order that it be fully appreciated. In this rebirth, precast, prestressed concrete has achieved prominence as a material for roofs and floors.

No single development can be cited as wholly responsible for these new qualities in precast concrete; many factors have contributed. First, perhaps, has been the designer's ability to understand and to utilize thin sections, as small as one inch in thickness, of high-strength concrete, and thus substantially reduce the weight. By combining thin sections with the use of lightweight aggregate concrete, further reduction in weight has been achieved, thus allowing larger members to be transported and erected.

Forming techniques have advanced also to allow the casting of more complex surfaces, without a proportional increase in cost. Capacities of motorized erection equipment have increased two to three times in the past decade; thereby, larger, heavier elements can be installed at remote locations. Prestressed steel reinforcement has provided a more economic use of high-strength concrete, greater durability to concrete, and a more economic means of reinforcement. Finally, precast concrete is favored by the cost difference between plant and jobsite construction labor, and fits into the growing architectural and structural trend to use plant-engineered and plant-fabricated products.

For the roofs and floors of buildings, two product types, the cored flat slab and the ribbed slab, find the greatest use.

The cored flat slab is most commonly manufactured in a modular width of 16 in., and in depts of 4, 6 and 8 in. Spans as great as 30 ft. can be utilized, depending on the load, reinforcement and depth. Because of their torsional strength and slab-to-slab interlock, these slabs form a stiff, non-yielding floor, while flat underside makes an attractive uncluttered ceiling. Because of their depth and insulating value, these slabs may be effectively used in roofs without further insulation.

The ribbed slab is characterized by an ex-

posed joist that is cast integrally with a thin concrete block. These slabs are normally fabricated in 2-ft. module. They may be in the form of a channel that is normally 2 ft. in width, or a double T that is 4 or 6 ft. in width. The channel slabs range in depth from 8 to 12 in., and 30 ft. is considered about the maximum span. The double T may have depths of 8 to 18 in., and spans up to 50 ft.

Precast, prestressed concrete slabs are suitable for use in railroad buildings—from the smallest maintenance building to the largest warehouse. The standardized products now available require only the architect's skill to incorporate them into produce and freight terminals, passenger terminals, canopied platforms, refrigeration plants, warehouses, maintenance facilities and administrative buildings.

Prestressed Concrete

Developed within the last few years, prestressed concrete is already recognized as one of the great advances in construction of the Twentieth century. Prestressed concrete provides builders with a material of superb strength, and economy. Thousands of bridges and buildings have been built of it, and the manufacture of prestressed concrete in the United States is approaching a billion dollar industry.

The idea is simplicity itself. Suppose we take a long block of concrete, put a bar of steel through it lengthwise, and tighten nuts at the ends of the bar, so that the steel is stretched, and its tension compresses the concrete. Concrete, which is strong in compression, also loses its tendency to crack when thus compressed; the steel, strong in tension, is tightened by the stretching. The stressed concrete span will now bear a considerable load. It is no longer brittle, but actually resilient. Indeed, with prestressed concrete, we can make a highly flexible fishing rod or diving board.

About one-third of the concrete in a rectangular beam of concrete with conventional reinforcement is assumed to carry the stress. It is assumed that approximately the bottom two-thirds will crack under load and, therefore, will not contribute to the beam's structural strength, but will merely add useless dead weight. In prestressed concrete, we "pre"-compress the concrete before the superimposed loads are applied and then, when loads are imposed, the concrete in the entire beam remains in compression. This means that all the concrete is helping to support the working load. The novel feature of the new combination is the built-in stress, which stores energy in the concrete and the steel, thereby, augments the strength of both.

The combination has several obvious advantages. It saves steel, because the steel sinews are merely cables or slim rods. The concrete protects the steel from corrosion and fire.

In addition, prestressing will:

(1) Make crackless concrete possible, which is conducive to greater durability under severe conditions of exposure.

(2) Make possible the economical use of high-strength concrete.

(3) Allow a reduction in the depth of beams and girders and the thickness of slabs, thus affording greater head room and clearance.

(4) Make it possible to use thin web concrete members of I and T sections, thus realizing considerable savings.

(5) Result in stiff members at working load, and offer good recovery of deflections caused by overloading.

(6) Make it possible to greatly increase economical span lengths, and offer possibility of design to fit a greater variety of job requirements.

(7) Automatically proof test a member because under maximum conditions of loading, the stress in the steel and the concrete will seldom exceed that produced by the initial prestressing.

(8) Make the entire cross section of the concrete available for resisting moment prior to cracking.

(9) Reduce the effects of shear and diagonal tension.

In the United States, the first use of prestressed concrete for structures other than tanks came in 1950, when a bridge of this material was built in Philadelphia. Now, there are thousands of prestressed concrete structures in this country, and more than two hundred plants engaged in producing the new building material.

The use of prestressed concrete on a large scale did not become feasible until high-strength steel became available at reasonable prices. The steel now employed can withstand up to 250,000 psi tension. In prestressed concrete the rods are kept at a tension of about 140,000 psi—several times the tolerance of ordinary steel. The high-strength steel is about four times more expensive than the ordinary metal, but as the

demand grows its cost will undoubtedly come down.

It is apparent that the prestressing idea can be applied not only to concrete but also to ceramics and other materials. These include bricks, timbers and even ordinary steel, which can be made to bear heavier loads by prestressing it with embedded sinews of high-strength steel. But the ideal combination, from the standpoint of economy and flexibility, is high-strength steel and concrete.

For the various forms and uses of prestressed concrete, three kinds of steel sinew are employed: Steel wires about ¼ in. in diameter; twisted cables from ¼ in. to 2 in. in diameter; and rods up to 1¼ in. in diameter. The sinews are stretched and tightened in one of two ways, called "pretensioning" and "post-tensioning." In the pretensioning process, the wires or cables are stretched first and released from their end supports after the concrete is hardened around them; their snap back compresses the concrete.

In the post-tensioning procedure, the steel wires are encased in tubes and remain relaxed until after the concrete cures—then they are stretched by jacks, and their ends are anchored against the concrete. The space around the wires and tubes is then filled with cement by grouting.

So far, the use of prestressed concrete has been limited, mainly, to large structures, such as bridges and buildings. The material yields great economies in the building of bridges. Engineers estimate that two billion dollars could be saved if prestressed concrete were used for one-half of the bridges planned in the current United States building program. Most of the 289 bridges on the Illinois Toll Highway, recently completed, were built of prestressed concrete, and the savings is said to be four million dollars.

Paint Products

Since World War II the most revolutionary item in buildings and structure has been paint. And the most revolutionary paint is the latex water-base paint which has proved successful in the last ten years. Indoors the latex paints are easy to apply with brush or roller, have low toxicity and generally dry to the touch in 30 min. Most will go on directly over newly dried plaster, cement, stucco and other lime-containing materials without any seal coat. They can be applied over flat, oil or alkyd base paints and over enamel that has been sandpapered. However, they should not be applied on raw wood unless a sealer has been first applied as the water raises the grain in the wood.

Latexes are not an all-purpose paint as yet, but the limitations are fast being overcome. At first they were produced in only flat or semi-gloss for inside painting, but now they are obtainable in high gloss also, and are fine exterior paints, provided the wood, masonry and metal are properly primed before use. An advantage of such paints is that they can be applied in damp weather and a second coat can be applied a few hours after the first.

Plastic Pipe

Plastic piping components are made of tough lightweight corrosion-resistant thermoplastic material. Such pipe is used primarily for conveying corrosive chemicals, purified water and solutions sensitive to contamination. It is not recommended for conveying some chemicals and solvents such as aromatic hydrocarbons, chlorinated solvents, esters, ketones, liquid chlorine, and liquid sulphur dioxide.

The piping has a high flow rate due to the smooth finish, and little tendency to accumulate internal deposits. It does not sweat in humid atmospheres and has little or no contamination effect on purified water and little or no effect on the taste and odor of the material conveyed.

Installation of plastic pipe requires no unusual techniques. Because of its lightweight it is easy to handle and cutting and threading are easily done with standard equipment.

The pipe and fittings have American Standard tapered threads, and tight joints result when made up with the number of turns recommended by ASA.

Plastic pipe joints appear to be tight before they actually are, but on the other hand can be tightened too much, resulting in stripped threads. However, after a little experience, the pipe fitter gets the "feel" of plastic pipe and is able to make a good joint without trouble.

The use of a strap wrench is recommended as jaw wreckers have a tendency to score and weaken the pipe. A good non-hardening pipe-thread lubricant should be used to prevent chattering and thread galling.

When installed underground plastic pipe should be placed below frost level or drained to prevent freezing. Before backfilling the pipe should be tested for leaks. Normal trenching and backfilling practices

may be used, but large rocks should not be dropped on the pipe.

Plastic pipe can be cut with a hack saw, band saw or circle saw. When threading this pipe the threader should be aligned properly so as not to reduce one side more than other, and normal cutting speed should be used. A tapered plug should be driven into the end of pipe to prevent distortion, and correct any ovality which may be present.

The fittings are made of the same material and can be had in threaded or flanged style in pipe sizes of from ½ in to 6 in, inclusive. They are, of course, designed to handle safely the pressure recommended for the corresponding size of heavy pipe.

Discussion

A member from the B&O asked how the precast concrete floor slabs were fixed to the beams. H. C. Wiemer (NP) stated that his road made cross-studies on this type of construction and they ran from $1.75 to $2.00 a sq ft. The lateral stability of the slabs is brought about by casting a small foot into the slabs. These are welded to similar members cast in the supporting beams. For roof slabs, he said his cost studies showed that prestressed concrete material costs about .80 cents a sq ft at the job site, .10 cents more to handle it, and .20 cents more to place the material on the roof. This makes the cost of a fire-proof roof relatively low, he said.

President Dick asked how the cost of translucent panels compared with other roofing materials. F. S. Cheselski (GN) stated that he replaced a large number of steel roofing sheets with the translucent panels which resulted in considerable savings. W. H. Bunge (MP) stated that the translucent sheets are approved by the Fire Underwriters. He added that when these panels are used, they make excellent skylights. His road has been using these for about ten years.

C. P. Wachter (CNR) asked the members what they thought of the masonry paints. He had used a number and did not think the results are very satisfactory. He said one advantage, however, of these paints is that the rubber base permitted a white color to be used over a dark.

W. L. Short (MP) warned that oil base paints could not be used on concrete because of the alkalinity of the concrete. However, he said, there are many paints for concrete application on the market. Some of these containing chlorinated rubber, and epoxys are good for use on concrete and are very durable. They can be obtained in any color and even with a bright appearance.

Mr. Wachter wondered how such paints would perform when used on brick or stucco. He had placed two or three coatings of this paint on stucco and it had washed off. This was poor economy, he said. Mr. Wiemer referred again to the prestressed concrete roof slabs. He wondered what sort of a top surface could be applied to them for weather protection. Mr. Bunge stated that he had used insulated board, ½ inch thick at least, and then a bonded roofing was applied over this. Mr. Wiemer then questioned whether contraction or expansion would be a problem with this construction. J. E. Scroggs (Carter-Waters) stated that this was no problem as it was negligible.

Materials and Methods for Extending the Life of Existing Structures

Report of Committee

COMMITTEE—J. F. WARRENFELLS, *Chairman,* ch. engr., JACKSONVILLE TERM., Jacksonville, Fla.; H. F. LUCAS, *Vice-Chairman,* asst. engr., CMStP&P, Chicago, Ill.; C. M. BURPEE, *Vice-Chairman,* exec. dir, AWPI, Chicago, Ill.; E. H. BARNHART, div. engr. (ret.), B&O, Sheperdstown, W.Va.; Y. C. BEAM, mast. carp., SAL, Americus, Ga.; J. E. BLAKE, supv. struct., PRR, Williamsport, Va.; G. C. BUSKIRK, mgr. r.r.dept., U.S.BORAX & CHEM., Omaha, Nebr.; L. E. FLINN, v.p.,r.r. div., DEARBORN CHEM., Chicago, Ill.; R. B. MIDKIFF, ch. engr., m.w.&s., SOU, Knoxville, Tenn.; C. L. MOSER, b. & b. supv., SOU., Asheville, N. C.; R. PATTERSON, consult., Chicago, Ill.; J. W. ROWLAND, asst. engr.-const., LI, Jamaica, N. Y.; A. P. SMITH, asst. engr., C&EI, Danville, Ill.; W. STANCZYK, detailer, CMStP&P, Chicago, Ill.; T. M. von Sprecken, asst. to ch. engr., SOU., Washington, D. C.; D. L. WILHITE, sls, rep., U.S.BORAX & CHEM., Atlanta, Ga.

J. F. WARRENFELLS
Chairman

This subject should properly consider general aspects of building maintenance. First, is the suitability of the structure for present and future operation. Next, and not necessarily in order of importance, are: costs, methods, and materials.

Frequently, alterations and partial retirements enter into plans for force reductions and operating economies. If the structure is large enough, and is strategically located, alterations can be made to accommodate tenants, thereby producing secondary revenues.

A thorough inspection is the first step, after which decisions as to materials and procedures can be made. Planning the work will pay large dividends with lower costs and less future maintenance.

Foundations

Foundation repairs should include the use of permanent type materials only. Termite shields should be used where timber floors exist. Take a good look at the floors. If extensive repair or replacement is necessary, rip out the floor before starting foundations repairs. This will make the work more accessible and should reduce labor costs.

Where practicable, timber floors should be replaced with concrete on compacted fill. Where sills and joists are to be replaced, treated timber is worth the price. Where foundations show signs of cracking, settlement, or deterioration, usually the wisest course is to replace rather than to repair, otherwise you may cover up someone's mistake.

Concrete floors which have settled may often be repaired by mud jacking. Where floors have to be broken up to repair either the floors or foundations, the use of a concrete saw is well worth the rental cost of the equipment. By making straight cuts in the concrete one is able to break out only the areas desired without damage to adjoining concrete. Also, labor costs are drastically reduced, the remaining concrete will have a neat vertical face that can be doweled for expansion or construction joints, and the overall quality as well as the appearance of the work will be improved.

Floors

If the budget will not permit replacement with a concrete slab when floors are worn and the foundations are adequate, wood floors may be covered with an underlayer of ply-

wood, or composition material, then finished with asphalt, vinyl, or plastic tile. This will lend a more attractive look, and will cost no more than replacement in kind.

Industrial concrete floors may be covered with 1½ in. to 2 in. of asphaltic concrete with a mineral content high enough to resist indentation or cracking with seasonal weather changes. Extensive damage to concrete floors warrants replacement. Before replacing such floors, be sure that the immediate subgrade as well as the adjacent areas are well compacted and ready to withstand the demands of loads and usage.

Drainage

Perhaps it can be said that the best ounce of preventive maintenance on any type building is proper drainage. This is true from the foundations to the roof. Water is the worst offender! Get rid of the water and you will lower building maintenance costs. Drain the water away from foundations, and provide for circulation of air under wood floors to prevent decay.

Roofs

When making roof inspections be sure that you know the history of the roof. If the roofing material has reached its life expectancy it should be removed and replaced with the best materials your budget will allow. Roof patching materials have their place, and may save large sums of maintenance money if used wisely. However, they should never be used in lieu of replacements if the existing roof has reached "retirement age."

Proper deck repairs are, of course, the first order of repairs, after which the material of your selection may be applied. Wood decks may be replaced with gypsum on concrete slabs, where supports will permit. There is not a great number of new roof products on the market, but there is enough to warrant a thorough investigation before buying. Corrugated or galvanized iron may be replaced with corrugated aluminum, or aluminized steel.

One of the newer built-up roof products is made with glass fibers. It has the advantages of long fibers that do not separate under expansion and contraction little or no deterioration, and porous enough to permit complete saturation with the bonding material being used. It is very light, and is easy to apply. Costwise, it compares favorably with the asbestos felts that have always been one of the better materials.

The use of an aluminum roof coating instead of gravel is worth a good look. Gravel serves as a reflector for the suns rays and as a sort of dam or check for the asphalt. Also, it does contribute to the good-looks of a building. Beyond that, it is expensive to apply, and hard to patch. Aluminum can be rolled, brushed, or sprayed for labor costs as low as 50 cents per square. It has a high insulating value that should contribute to the life of the oils in the bonding material. Walking on it does not damage it, patching over it is no problem, and it may be renewed easily. By actual tests, roof temperatures were lowered 17 deg. where aluminum roof coatings were applied. When applying on a new roof, the roof should cure 45 to 60 days before application is made.

Gutters and downspouts should be placed in good condition. The field is wide open for someone to manufacture a permanent-type roof gutter that will compare costwise with galvanized metal and have a long service life.

Waterproofing

One of the worst problems on the old "monumental" railroad building is that of maintaining the untold number of cornices, ledges, parapets and just plain decorative junk. In some instances it can be removed without damage to the structure or the aesthetics. If it can't as with wood, paint it!

In the case of masonry use the best grade of non-shrinking caulking compound available, and make every effort to stop seepage or leaks by proper pointing. Where leaks persist around such places, it may prove economical to coat with shotcrete after proper preparations have been made. This could well afford an opportunity to fill in some of the sharper, inaccessible corners where water is trapped.

Keep masonry walls sound and waterproof by careful pointing or coating, or both. Waterproofing of masonry walls can best be effected through the use of a non-shrinking type crack filler, and one of the many silicone solutions sold for this purpose, although clear silicone has a short life. If a color change is desired, the waterproofing and painting may be accomplished in a single operation through the use of a cement, rubber, resin or asphalt-base coating applied in accordance with the manufacturers specifications.

There are still a great many small masonry buildings that were erected during World

War II when brick and concrete were available, but steel for roof trusses or decks was not.

Some of the steel manufacturers will fabricate a complete roof for such buildings at substantial savings over replacement with wood. There are also a number of prestressed concrete roof decks that are light enough to be considered for roof replacements. While this will necessitate a roof application, there will be no interior finish work except painting. It will be necessary in most cases to pour a concrete tie beam along the top of the wall, so that the slabs can be anchored to a flat surface.

Structural-steel Painting

Special attention should be given to structural-steel painting. A thorough cleaning job is of first importance if there is extensive rusting. If the primer coat is applied on a dry surface, you have won the first round.

There are too many good rust inhibitors on the market to waste time experimenting. The safe bet is to use the one that has proven itself over the years. Labor is far too expensive to allow for improper cleaning and painting of steel.

According to information from the committee, the general average for a complete steel paint job is 11 to 12 years. If proper attention is given to the base material and its application, it is possible to get away with spot painting and one coat every 8 to 10 years at substantial savings for complete protection and appearance.

Another source states that some roads have replaced the above method with a single spray coat of protective material. Applied after scraping and air cleaning, the one coat is reputed to last 4 to 7 years, depending on the original condition of the steel. No overall second application is recommended as spotting in 2 or 3 years will give adequate protection, at lower costs.

Interior Walls and Ceilings

Interior walls and ceilings in old buildings are no longer the problem they once were. There are a great number of wall and ceiling "finish" products that offer permanent finishes at substantial savings in labor and material costs.

High ceilings result in high heating, lighting, and cooling costs. Plastered walls that are beyond economical repair may be torn out and replaced with one of the many products designed for this purpose. This will be the logical time to lower the ceiling to effect savings in heating, cooling and lighting. This may not be feasible in the industrial type buildings, but would apply in offices, waiting rooms, or public service buildings.

One of the newer or most improved products on the market is the acoustical tile. In addition to the acoustical value, some of the newer fiber glass tiles have good insulating qualities. Also, they are not affected by moisture or temperature changes, and are incombustible. When mounted in an aluminum, exposed, or non-exposed grid system, such ceiling may be installed for 50 cents per sq ft in place, exclusive of lighting. Flush-type fixtures that set into the grid system are very easy to install, and cost no more than other types.

While the committee recognizes the fact that lighting is not always under the jurisdiction of the b&b supervisor, we do realize that it is a vital and expensive part of the maintenance program. If your railroad does not have a lighting engineer on the electrical or signal department staff, you may take advantage of the free services offered by most of the manufacturers, and improve lighting conditions tremendously at little or no additional cost.

One of the better materials for interior walls, where appearances count, is pre-finished plywood paneling. It is manufactured in the standard plywood sizes, with finishes to suit all tastes. While the initial cost is approximately double that of regular plywood, the savings are evidenced through the erection and painting costs. Maintenance is confined to dusting and occasional waxing. No refinishing is required.

Any of the wall materials, such as plaster board, regular plywood, or any other that is manufactured in large sheets, is a potential labor saver, and should be carefully considered when interior walls are repaired. Use of these materials will prevent frequent, expensive, repairs to plaster walls and ceilings.

Exterior Walls

There are still numerous frame buildings on all railroads. They present a special problem in the maintenance of walls. If deterioration is not too bad, replacement in kind of rotten sections is recommended. In the case of buildings that are not air tight, and where weatherproofing is a factor to be considered, a complete replacement should be studied. Here again the use of material in large sheets will in most cases, save on installation costs.

The preparation of the surface to which exterior wall finishes are to be applied, is the most important phase of this operation.

The type of siding used will be governed by any number of situations. If the location is such that appearance is important, one may choose asbestos shingles or patterned sidings available in several colors. Any number of asbestos-protected metal sidings, aluminum, steel, or plastic sidings are available in various patterns, with natural or color finish. Any of these offer the advantages of fire resistance, durability, no painting, and little or no maintenance for years.

Special attention should be given to windows and doors. It has been suggested that, where windows can be properly repaired, but not made fully weatherproofed, a great deal of expense or future maintenance can be saved by installing a good make of combination, self-storing, aluminum storm sash at a cost usually less than $20.00 each installed, for the 100-in. limit. These installations will save the prime sash, save heating fuel, and provide screens for the summer without the cost of seasonal erection and storage.

Where sash or doors cannot be repaired, the wiser course is to replace them with aluminum, steel, or any other permanent type available.

While this committee recognizes the value of painting as related to extending the life of existing structures, we feel that it is a subject that can best be covered in a separate report. However, when painting is necessary, bear in mind that there is no substitute for a good grade of paint applied on a clean, dry surface, in accordance with manufacturers recommendations.

Maintenance methods vary with locale, but all railroads have a common problem. Railroad buildings, like railroad tracks, must be maintained under traffic. This should afford an excellent opportunity to sell your management on the idea for mechanizing your building gangs. There is a definite revolution, aimed at reducing labor costs through the use of machines. Machines such as the mobile-type cranes with scaffolds mounted on the boom, paint-spraying outfits, sandblasting equipment, and various air and electrical hand tools, are all potential labor-saving devices which should be exploited to the fullest extent. One crane, strategically located, can do the work of six men handling materials to an elevation.

We should not discontinue preventive maintenance to preserve structures that are generally in a good state of repair. However, we are forced to defer structure maintenance occasionally to comply with requests to lower operating costs.

Therefore, in conclusion, the committee offers the following advice: "Railroad maintenance problems are nothing more special or complicated than those found in a smaller way by the ordinary home owner. This fellow, if he is smart, subscribes to home-owners periodicals, and reads them. The b&b man has a wealth of good maintenance literature at his finger tips, and can get more for the asking. Keep abreast of the ever changing maintenance methods and materials through good reading habits."

Discussion

W. W. Caines (C&O) asked the question if fiber glass was put over old roofing. Chairman Warrenfells replied that it was not. The fiber glass should not be used for patching but should be used for new roofs only.

When F. W. Hutcheson (C&O) asked if aluminum paint could be used in lieu of gravel on flat roofs, Chairman Warrenfells replied that it could. After the hot asphalt has been applied, it should be left to cure for 45 to 60 days and then the aluminum paint applied. Chairman Warrenfells cited an instance where he had applied the aluminum paint in this manner a year ago and had noticed that some alligatoring was occurring. He believed that this was the result of insufficient curing time. He was going to make some spot applications to the patches and believed that this would suffice.

E. R. Simmons (SLSW) stated that he believed it to be economical to re-mop some built-up roofs to extend their life. Chairman Warrenfells stated that this had not been covered in the report but that he believed the practice to be economical. However, he said, some newer roof products are available having more durability.

R. L. Fox, (Sou) stated that, while the report was excellent insofar as buildings was concerned, it did not cover bridges. Chairman Warrenfells agreed that bridges have not been covered in the report, but then it would make the report too long. As a result, he decided to confine the report to buildings only.

Mr. Fox stated that when coatings are applied to bridge ties, it helps keep down

the moisture content and that he believed the coatings would double the life of the ties. He stated that he thought this would make a good report for the association to follow as such coatings have a far reaching benefit and savings.

H. D. Curie (B&O) announced that he had installed some aluminum storm windows in a tower where 31 of the existing windows were deteriorating badly. He put in 9 of the replaceable type windows with aluminum sash and storm windows, and as a result, he has noticed that the heating bill has been cut in half. Also, he added, the interchangeable screen units save a great deal of labor when changing between seasons.

Contracting Work in the Bridge and Building Department

Report of Committee

COMMITTEE—W. W. Caines, *Chairman*, supv. b. & b., C&O Huntington, W.V.; J. W. N. Mays, *Vice-Chairman*, asst. engr. struct., PRR, Philadelphia, Pa.; S. White, *Vice-Chairman*, gen. b. & b. supv., SP, San Francisco, Calif.; R. H. Akers, r.r.sls. mgr., ARMCO, Cleveland Ohio; D. J. Bertel, div. engr., MP, DeQuincy, La.; R. D. Bisbee, div. engr., P&SF, Slaton, Tex.; A. M. Glander, ch. carp. (ret.), CMStP&P, Austin, Minn.; J. A. Jorlett, area engr. PRR, Philadelphia, Pa.; S. E. Kvenberg, supv. bldg. maint., CMStP&P, Chicago, Ill.; W. C. Oest, prin. asst. engr., FW&D, Ft. Worth, Tex.; J. L. Perrier, div. engr., C&NW, Chicago, Ill.; W. F. Petteys, engr. m. of w., ERIE, Jersey City, N. J.; A. C. Price, b. & b. mast., CPR, London, Ont., Can.; W. B. Roof, const. engr., ARMCO, Middletown, Ohio; C. L. Tanner, gen. fore., b. & b.-w.s., P&SF, Slaton, Tex.; R. Wall, b. & b. supv., SOU, Selma, Ala.

W. W. Caines
Chairman

Those who are responsible for planning and executing bridge and building work programs are constantly facing the decision as to the most economical means, methods and materials to be employed. This is equally true of both normal maintenance including replacement of important structural components, and improvement projects of whatever nature and magnitude. Of the factors of means, methods and materials, it is the purpose of this report to deal only with the means of doing the work, specifically by the use of railway company forces or by contract with outside companies. Quality control of methods and materials will in any case be covered by specifications and inspection.

Advantages of Contracting Bridge and Building Work

No man, or group of men, however skilled, can be experts in every class of bridge and building work. Therefore, it seems logical that bridge and building forces should largely confine their efforts to the more or less routine work required for maintenance of bridges and buildings in order to keep such structures in safe repair. This also would include replacement of structures where such work is within the capacity of the bridge and building forces to handle properly to the best economic advantage of the railroad company.

Another advantage lies in the area of equipment ownership and upkeep. Machinery inventory should be kept to the minimum commensurate with planned utilization. The more work contracted, the greater the share of inventory burden carried by the contractors. Conversely, if only occa-

sional jobs are left to contract, it will continue to be necessary for the railways to keep much specialized equipment available. In evaluating this advantage, however, the possible economy through a plan of equipment lease-rental should be taken into consideration.

Contracting provides flexibility to expand programs to meet special needs or emergencies. The tools, equipment, materials and personnel available to the railroad is often too limited to permit this flexibility. Contracting is often more economical than doing work with company forces. This may be due in part to the application of special skills with specialized equipment and in part to greater utilization of labor. The work force in a normal bridge and building gang is not usually tailored to a specific job, and expenses are involved for camp cars or other housing and travel time to and from work locations.

As seniority rules do not usually apply to contract forces, employees in various crafts can readily be furloughed for periods when not required. For the same reason, it is usually easier for a contractor to release inefficient or undesirable personnel. Likewise, contracting the non-routine or extra bridge and building work that cannot be handled by regularly assigned forces would result in fewer temporary or part-time railway employees claiming unemployment compensation during furlough periods.

There are, of course, instances in which railway companies have little or no option as to who shall perform a given job, regardless of their complement of equipment and their organized personnel. These include the assembly, fabrication and installation of certain types of special materials and fittings.

Materials, tools and equipment required in such jobs are manufactured by individual companies under patent rights and are available only through certain designated suppliers and installers. Contracting such work is, under these conditions, almost imperative. The working agreement in force on some railways do not prohibit contracting bridge and building work.

Disadvantages of Contracting B&B Work

Contract labor is generally incompatible with railroad labor. This makes for dissatisfaction and hampers coordination of railroad and non-railroad personnel on projects where harmony and cooperation would be desirable. Contract work requires close inspection by the railroads; adequate inspection service is often hard to provide, in addition to being basically non-productive. Contract work is often the seat of jurisdictional disputes whch may cause serious loss of time and productive effort. Contract work thus can become the source of much dissatisfaction by employees, and contribute to low morale, possibly creating situations favorable to strikes and job slowdowns.

Other disadvantages include the fact that supervisory staffs are maintained by both railway companies and contractors, which usually is a source of wasteful duplication. This situation could be obviated only by eliminating one or the other work methods, a thoroughly impractical course.

Contractors' forces, in general not being familiar with standard practices for maintaining railroad traffic while work is in progress, may be inclined to disregard or minimize the importance of maintaining traffic safely and without delay to trains. It is more difficult to control and co-ordinate contract work where it interferes directly with train operation or track structures, than is the case with railway personnel.

Contractors' forces for a single job usually include members of a number of crafts covered by different working agreements, sometimes resulting in jurisdictional disputes and requiring employment of a certain craft to do some work which requires only a small portion of the working day. As an example, on a job involving replacement of timber tunnel lining with concrete and shotcrete done by contract, employees covered by 18 different working agreements were employed by the contractor to do the same work ordinarily performed by employees of one railroad craft and covered by one working agreement. On this job, where 50 to 60 men were employed the work was delayed 30 days at a critical time by a strike of one craft whose agreement covered only one employee on the job. Where bridge and building work is being done by contract, it is usually more satisfactory for these reasons not to work railroad company forces with contractors' forces, except in necessary areas of supervision and inspection.

Because of the many crafts usually involved, contractors' forces are not as flexible as railroad forces and cannot be used as readily in diversified work or in extensions and changes due to alterations to plans

because of unforeseen conditions or emergencies. Some railroads have experienced work interruptions by contract forces because of labor disputes during emergency repairs to structures involving complete tie-up of main lines. No similar incidents involving railway forces have been reported.

It is believed that most contractors would not wish to accept a job of replacing three or four stringers in a timber deck. If such a job were accepted, it would be expensive, possibly prohibitive in cost. However, such work has to be done, and if the railroad has to maintain a staff to do its small jobs, such a staff can ordinarily do more work at lower cost than could be done under contract.

Conclusions

(1) In general, where bridge and building work is performed under contract it is preferable not to work railway company forces with contractors' forces, except in areas of supervision and inspection.

(2) The relative economy of performing bridge and building work by company forces and by contract, whether routine maintenance jobs or improvement projects, must be determined by the railway companies in the light of each individual carriers' conditions, involving of course its working agreements with its employee crafts, its situation with respect to trained and available personnel, availability of materials and their patented aspects.

(3) With the assumption that there are no objectionable factors as mentioned in (2) above, it may be stated that any given railroad that maintains an adequate supervisory staff and experienced forces can perform all of its bridge and building maintenance work and many improvement projects, except those jobs requiring special skills, equipment and materials, with equal or greater economy than such work could be performed under contract.

Discussion

M. J. Hubbard (C&O) sponsor of this committee, said the report did not go into the different forms of contracts because there are so many. He also stated that it was sometimes difficult to procure liability insurance for small jobs, which requires the railroads sometimes to take out insurance on a $10 item.

H. C. Wiemer (NP) announced that his road was in the process of eliminating many small buildings owing to dieselization of the road. He is making an effort to sell these buildings without taking out insurance. So far, he said, he has been getting by satisfactorily.

Mr. Hubbard told of a project where subcontractor lost a couple of men on the job and his insurance did not cover this situation. As a result, he said, the men sued the railroad.

W. H. Bunge (MP) announced that his road is disposing of the small buildings through his purchasing department so that no contractors were involved. Hence, he said, no insurance was needed. Protection was provided by the purchasing agent when he made out his sales order.

C. E. Wachter (CNR) stated that buildings on his road are sold to the highest bidder so they have no insurance problem. However, he had one contractor who was taking down a tall stack. The contractor could not get insurance because of the stacks proximity to the roundhouse and no bonding company would cover him for this situation.

Mr. Hubbard stated that it is a distinct advantage to dispose of buildings to outside parties by sale.

President Dick asked how the railroads decide when to contract work or do it with company forces and called upon W. B. Throckmorton for a reply. Mr. Throckmorton (CRI&P) stated that many factors enter into a decision of this kind so that no clear determinations can be stated. In general, he said they try to do all the work they can with company forces. His agreement with union organization covers this situation. On large jobs where specialized equipment or specialized labor crafts are required, he first discusses this with the labor representatives and they agree on what work shall be contracted. Some portions of jobs must be contracted because of municipal codes such as those covering plumbing, electrical work and so forth. Also he said, the location of the job makes a difference and also whether it is a bridge or a building that is involved.

Sometimes, he continued, divers are required at bridges and the railroad is not prepared to do this work. In such instances, the union is agreeable to contracting such work. On most of the small jobs, however, the unions usually insist upon doing that work. Each job must be analysed by itself to determine whether or not contracting is to be considered.

G. W. Benson (CofG) stated he had a job where a contractor furnished a diver and a

superintendent, as well as all of the equipment necessary, while the railroad furnished all of the labor. This worked out very well, he said.

Recent Developments in Fire-Protection Methods

Report of Committee

COMMITTEE—R. D. HELLWEG, *Chairman*, asst. reg. engr., GM&O, Bloomington, Ill.; H. M. HARLOW, *Vice-Chairman*, asst. gen. supv., C&O, Richmond, Va.; R. H. CARPENTER, *Vice-Chairman,* engr. m. w., MP, St. Louis, Mo.; R. L. HECKER, b. & b.-w.s. supv., C&O, Plymouth, Mich.; W. R. HYMA, asst. engr., AT&SF, Chicago, Ill.; C. A. KLEIN, br. maint. equip., READING, Philadelphia, Pa.; L. R. MORGAN, asst. res. engr.-struct., AAR, Chicago, Ill.; ROY C. PATTON, ROY C. PATTON, Jacksonville, Fla.; R. O. PHILLIPS, asst, to pres., ZONE, Ft. Worth, Tex.; J. R. PEARCE, supv. b. & b., L&N, Latonia, Ky.; G. W. POTTS, asst, b. & b. supv., L&N, Knoxville, Tenn.; W. L. SHORT, asst. engr., MP, St. Louis, Mo.; R. G. SIMMONS, gen. rdm., CMStP&P, Chicago, Ill.; D. C. SMITH, sls. mgr., KOPPERS, Pittsburgh, Pa.; E. F. SNYDER, asst. to ch. engr., IC, Chicago, Ill.

R. D. HELLWEG
Chairman

In 1958 the fire loss on our American Railroads was $16 million, an all-time high. This makes it necessary for all of us, as officials on our respective railroads to be ever mindful of our responsibility to our management in the never-ending vigil of fire prevention. As information, over the past 35 years, 1935 was the year in which the smallest amount of fire loss on our railroads was recorded. Even in that year the loss was $3.2 million.

The average annual fire loss to our railroads over the past 35 years was $8 million. Just think how many men this amount of money would employ or how much material this could buy.

Due to the present high cost of construction it is necessary that railroads must maintain structures that are outmoded by our present-day standards of fireproof buildings. This and the above prompts your committee report of recent developments in fire protection methods.

To completely cover this vast subject would be impossible in the time allotted. However, it is a subject that should be close to each and every one of us and we will endeavor to give you an outline of progress that has been made in recent years on the following protective measures — measures which can be taken by all of our roads if they so desire.

(1) Fire protective coatings.
(2) Fire protection equipment.
(3) Adoption of a proceduce for fire inspection.
(4) Fire prevention thru good housekeeping around bridges.

Fire Protection Coatings

Fire-protective coatings are not new aids to fire protection as various coatings have been available and on the market for over 60 years. It is true that fire-protective coatings of a reasonably successful material for specific application to creosote-treated timbers is a comparatively new development. Fire-protective coatings, for purposes other than to protect creosoted timber from fire, have been widely used for many years by different governmental agencies and industrial installations.

The railroads' use of these materials has been for the protection of hospitals, converted roundhouses, diesel locomotives, decking of flat cars and refrigerator cars for

hot-box protection, around fan-belt pulley areas in refrigerator cars, bridges and trestles, centralized-traffic control rooms, telephone and telegraph rooms, and around shop facilities.

Because of the peculiar nature of a coating that would be suitable for the diversified problems incident to railroad operations, the Fire Protection and Insurance section of the Association of American Railroads has adopted specifications for protective paint. For your information these specifications are as follows:

(1) A certified report of an accredited testing laboratory showing the coating material submitted meets Federal Specifications SS-A-118b.

(2) Must have certified copy of an accredited laboratory showing temperature range of the submitted material. Desire 2,000 deg F to minus 30 deg F at recommended square foot coverage.

(3) Manufacturers recommendation of square foot coverage to protect all creosoted, untreated, or creosoted-petroleum members on bridges and trestles. Desire at least 50 sq. ft. per gal.

(4) Certified copy of accredited testing laboratory report showing thermal conductivity, or K factor of not more than 2.25 B.t.u. per hr, per sq. ft. per deg. F, per inch thickness.

(5) Must be certified copy of report from accredited laboratory showing the coating has been applied over creosoted, or creosoted-petroleum oil test panels, according to the manufacturers recommended square foot coverage and has passed adhesion test in a twin arc wet and dry cycle weatherometer for a minimum of 1,000 hours without film failure. Report should also show that at the end of the cycle, panels were subjected to severe vibration and impact tests. No adhesions of coating was lost.

(6) Then a panel, removed from the weatherometer machine at the 500-hour exexposure without film failure be placed over the Meeker burner with the flame five inches from the underside of the panel. The flame test shall run not less than 12 continuous minutes with temperatures not less than 1400 deg. F. without film failure.

(7) Must have certified copy of an accredited laboratory report showing material meets 30 per cent salinity test. (Immersion in 30 per cent NaCL solution for minimum 12 hours of panels having a minimum of 600 hours in a wet and dry cycle).

Material meeting these specifications will provide an extremely good all-purpose coating that will have excellent bonding qualities, and will resist weathering, vibration, salt, flame and heat.

Considerable study has been made by several railroads in connection with the use of additives to the regular creosote or creosote coal-tar preservatives used for bridge timbers. It has been found that reasonable success has been experienced and the AAR Committee on Fire Protection and Insurance section in its report in the 1958 Annual Proceedings states—"Insofar as the committee is aware, there has never been an additive test that has burned the specimen to destruction. All fires have been extinguished themselves without substantial strength loss in the specimen."

For your general information, the following is given to explain the action of phosphorous derivatives as additives for fire-retardant action The action is initiated when the surface temperature of the timber rises above 350 deg. F. At this temperature, the phosphorous compound decomposes into a strong oxidizing agent which attacks the wood cells near the surface of the timber. The outer layer of the wood is literally converted to charcoal, which acts as an insulator, slowing down the distillation of wood products underneath.

One manufacturer states that the cost "adds less than 10 per cent to the overall cost of a ballasted-deck structure. For example, the degree of protection specified by one major railroad amounts to $11 to $13 per lineal foot of trestle. These figures assume a structure containing an average of 32 cu. ft. of wood lineal foot and preservative retention of 12 lb. per cu. ft. Little if any modification of standard pressure treating practices is necessary, since the material mixes readily with oil-type preservatives.

"The stability of the material under commercial treating conditions was studied in a plant test involving eight consecutive charges, using a solution in creosote-petroleum. No depreciation in content was noted in the two-week test period, suggesting also that the material is not preferentially absorbed by the wood. Strength tests conducted on carefully matched wood specimens treated with a creosote-petroleum solution and the additive, indicated no detectable loss of strength after laboratory weathering."

Fire-protection equipment for diesel

shops and around fueling stations is an important fire-protetction must, but it is not any more important than good fire-prevention measures around these points. Around fueling stations it would be well to look into the feasibility of using leak-free nozzle connections and automatic shut-off valves. Various manufacturers have a number of these devices in actual service on various railroads and they do reduce spillage to a great extent.

In our diesel enginehouses we must be ever mindful of the danger of a large accumulation of soot and deposit on ceilings. Good housekeeping, including cleaning and painting with a fire-retardant paint is what one railroad recommends. Now as to the fire protection equipment needed in diesel enginehouses, it is recommended by the AAR that a suitable supply of dry-chemical extinguishers, carbon-dioxide extinguishers or foam extinguishers be readily available for combating a blaze in its infancy. Out side of the buildings there should be dry-chemical extinguishers, foam extinguishers and hydrants with suitable water supply to combat a sizable fire.

Adopting a Procedure

Fire safety on any railroad, as in all industry, is the direct responsibility of management. Usually top management designates a staff official to institute and implement a program to reduce fire loss and keep such loss at a minimum. One of this official's most important responsibilities is to institute and maintain an efficient system of fire inspection of the properties of the railroad. Such an inspection is required to keep maintenance at a high level; to see that fire prevention methods and procedures are continuously maintained; and that fire equipment is adequate and ready for use at all times. The fire prevention officer is also an investigator and, being in close touch with the property and its circumstances, is in the best position to make a thorough investigation of any fire that may occur.

Because a good inspection is so exacting and detailed in nature, an investigation can be expected to be handled with the same exactness and attention to detail. The following basic standards for inspection work are recommended:

A. There should be distinct assignments of responsibility.
B. The fire-protection official and his staff should have adequate technical knowledge.
C. Appropriate standards should be adopted.
D. Effective protection and test procedures should be established.
E. Effective administrative procedures should be adopted.
F. Management should give fire-protection work sufficient attention to insure a coordination of effort and a degree of individual responsibility to the authority delegated.

The application of the general inspection procedures recommended in this report would, of course, be subject to adjustment by individual railroads depending on the fire protection official's assigned duties. If his sole responsibility is to establish a program to reduce fire losses, the full range of fire-protection procedures may be followed. However, if the officer must conduct the fire-protection program in conjunction with other duties, then some adjustment in procedures must be made to adopt them to the time allocated for this work.

The committee considers it desirable that all large railroads establish a Fire Protection department headed by a qualified Fire Protection Engineer, having officer status and full jurisdiction and responsibility over all phases of fire protection He should represent management in all matters pertaining to his specialty; he should establish policies and procedures and should have authority to make decisions.

Good Housekeeping

Fire prevention through good housekeeping around bridges and trestles incorporates a number of things, such as scalping under all bridges an area 50 ft. wide, being 25 ft. on each side of the center line of the bridge and extending at least 15 ft. beyond each end. One road reports: "Scalping was done several years ago and a soil sterilant was applied. Since then it is only necessary to scalp every two years prior to the application of a soil sterilant, which is done in December and January."

A second railroad reports that "hand scalping has been entirely eliminated by the use of soil sterilants." Another railroad reports: "On long pile trestles, where subgrade and soil conditions are suitable, earthen fire walls are constructed if the total bridge area of opening is not required for waterway. Minimum length of such a fire wall fill is 50 ft. Fire walls are placed when the total length of the bridge is over 500 ft.

long on primary mainlines and 1,000 ft. long on secondary and branch lines.

Other type fire walls are solid concrete bent curtain 20 in. wide at the top, at base-of-rail elevation, with 2 in. in 12 in. batter on either side extending to one foot below natural ground line Also, concrete pile bents with a concrete cap 3 ft. 6 in. in depth and a one-foot wide fire curtain extending to the base of rail elevation. In high winds, when the direction of the wind is along the track alignment, these walls are not too effective. Our other type fire wall considers the wind in its construction. It simply is one or more panels of ballasted-deck concrete trestle long enough to cause a fire break regardless of wind."

Still another road reports: "On buildings and bridges alike, we rate reinforced concrete first; brick-wall construction for buildings second, and hollow-tile walls for buildings third as their choice for various types of fire wall construction."

These are all good items and should be considered by all of us.

Good housekeeping was and is one of the best fire-preventive measures that can be taken. In other words, keep your properties clean and in order.

In conclusion, we say that, in spite of important progress made during recent years toward the development of fire-retardant materials for use on our bridges and buildings, there has been no great rush by our industry to generally accept the products offered. However, there has been some progress as a number of railroads have, in recent years, undertaken construction programs to fireproof key structures. An increase in protection work, along with continued research and development of ever improved methods and retardants, can be expected in the years ahead and it is the duty of every one of us to sell our management on the need for good adequate and safe fire protection.

Discussion

E. R. Schlaf (IC) read a copy of a report by the AAR fire protection and insurance section committee concerning a fire at Clearing, Ill., which was started by a spark which lodged in the roof of a roundhouse

H. C. Wiemer (NP) stated that his road is putting smoke jacks in all their old roundhouses to eliminate fires. This work, however, was retarded because the various types of diesel locomotives have different locations for their exhausts. In general, he said, they coated the hazardous roof area with sheet metal, which helped to eliminate fires. The metal is so placed that it is away from contact with the roof and allows for some ventilation. Mr. Schlaf asked if this metal protection was really effective. Mr. Wiemer stated that sheet metal can be a detriment at some times. For instance, he had a bridge which was covered with the sheet metal and when a fire did occur, the metal prevented the fire from being quenched. As a result, the bridge was destroyed.

Mr. Wiemar stated that he is installing some exhaust fans in some of the roundhouses, but this is mostly for the comfort of the men and not for fire protection.

Mr. Wiemer cited another occasion where leaking gas from a nearby gas works blanketed a railroad bridge. A spark set the gas afire as well as the bridge. The latter could not be reached with water so they used fire extinguishers. These, however, seemed only to intensify the fire. The only way that he saved the bridge was to bring in a large number of pumps which were used to deluge the bridge and drown the fire.

E. R. Simmons (SL-SW) stated that he had two fires at enginehouse shops. One, at Pine Bluff, Ark., was caused by a soot deposit on the underside of the roof. Fortunately, he said they didn't have too much loss because the fire was put out before it got well under way. At another location, exhaust fans pulled the soot up into the "doghouses" in the roof where it collected on the floors of the doghouses. One of these caught on fire. His road is now lining the doghouses with an asbestos type material and installing a baffle plate which can be easily cleaned of soot.

Mr. Simmons then referred to fire walls on bridges as mentioned in the report. He had a bridge fire where concrete fire walls, 18 in. thick didn't do any good because the fire jumped over the wall.

Mr. Schlaf announced that his railroad is using a new type of telescopic smoke jack which they hope will eliminate fires. These are attached to the stacks of the diesel locomotives when they come in.

M. J. Hubbard (C&O) stated that his road has had success in cleaning the roof deposits, even though of a greasy nature, with high pressure cold water which tears the deposit loose.

G. A. Linn (C&NW) stated that he has been using a fire-protection paint which has proved quite effective in preventing fires.

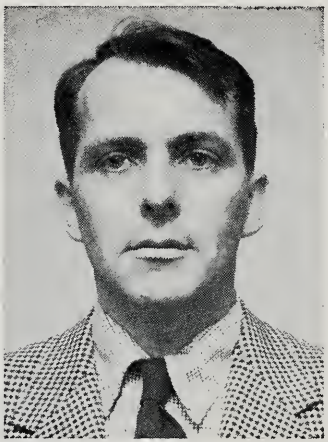
Mr. Schlaf stated that the Fire Underwriters have a standard method for testing various materials for fire resistance. In testing fire retardant penetrants, the three items which are judged are: Rate of flame spread; fuel contributed to the fire; and the amount of smoke produced. The "zero" for these three tests is that produced by asbestos.

J. A. Rose (CPR) stated that his road used telescopic smoke jacks but found them not very satisfactory because of the various types of exhausts on different locomotives.

Effect of Preventive Maintenance on Work Equipment

Report of Committee

COMMITTEE—R. H. MILLER, *Chairman*, maint. engr., LS&I, Marquette, Mich.; R. R. GUNDERSON, *Vice-Chairman*, engr. m.w., WM, Baltimore, Md.; J. E. PEFFLY, *Vice-Chairman*, asst. b. & b. supv., PE, Los Angeles, Calif.; G. W. BRENTON, gen. supv., b. & b., D&RGW, Denver, Colo.; E. M. CUMMINGS, div. engr., B&O, Connellsville, Pa.; L. J. DENO, div. engr., C&NW, Green Bay, Wis.; O. E. FORT, asst. ch. engr., StL-SF, Springfield, Mo.; JOHN FOX, engr. m. of w., QC, Sherbrooke, P.Q., Can.; E. F. GARLAND, br. supv., NOPB, New Orleans, La.; J. M. GILES, spec. rep., CATERPILLAR, Peoria, Ill.; P. L. KOEHLER, supt., C&O, Covington, Ky.; J. B. MCMANN, gen. b. & b. fore., UP, Omaha, Nebr.; M. L. REYNOLDS, asst. b. & b. supv., SP, Bakersfield, Calif.; I. A. MOORE, ch. engr., C&EI, Danville, Ill.; C. E. WACHTER, b. & b. mast. CNR, Port Arthur, Ont., Can.



R. H. MILLER
Chairman

Your committee was given its assignment with the specific recommendation to "study methods used on different railroads in preventive maintenance—to what extent traveling roadway mechanics are used, frequency of various inspections and tests, frequency of oil changes (which is becoming quite a controversial subject)."

With this in mind, your chairman posed the following questions to the committee as a whole in order to develop ideas for the report:

(1) What are the causes and effects of work equipment failures?

(2) How can we reduce or eliminate failures and breakdowns to work equipment?

(3) What are the best-known methods to get the most out of our work equipment and its component parts?

(4) Can we develop a workable yardstick to show how much maintenance and repair work should be done on the machine by its operator, how much should be done by the field repairman, and when the machine should be brought into a central shop for repairs?

(5) Can we, as supervisors, develop a personal yardstick, or checklist to see that machines are functioning to their best ability, and to see that our operators and maintenance men know what is expected of them, and are carrying out their duties properly?

Before answering any of the above five questions, we must be more precise, and define the phrase "preventive maintenance."

Preventive Maintenance, for purposes of this report, may be defined as the process whereby maintenance-of-way work equipment is kept in satisfactory mechanical condition so as to enable it to meet the demands offered without failure while in service. Much material has been published about this subject, both by the manufacturers of

our work equipment, and by the American Railway Engineering Association, all of which should be thoroughly digested by supervisors having anything at all to do with work equipment. This report, then, has the duty of filling the gap between the published material, and the application of this information in the field, or on the job.

First of all, we should start by defining the causes and effects of work equipment failures: The chief cause of failure is insufficient knowledge on the part of operators and supervisors, and lack of care of the equipment. Stated simply, failure occurs when the nuts and bolts are not kept tight, or when the machine has used all the lubricant formerly applied to it. Also, to a certain extent, changing operators frequently is liable to contribute to failure.

Another cause of failure might be attributed to usage heavier than that for which the machine is designed. Other rather obvious causes of failure can be attributed to using the wrong type of fuel and lubricants, foreign matter in the fuel, amateur repair work by unqualified personnel, vandalism, pilferage, and simply a lack of interest in the machine or its performance by individuals who should show interest.

Very few breakdowns occur because of parts failure, or poor workmanship on the part of the manufacturer, and most breakdowns or failures can be prevented by correct maintenance procedures.

The effect of work equipment failures is rather obvious—increased cost to do the job, and delays to the previously devised schedule of usage. In turn, considerable embarrassment may result when one has to explain to his superior why a job has overrun its estimate, or why it is not on schedule. Also, if spare machines are not available (as is the case with many smaller roads), expensive punitive time may be used getting a disabled machine back in service.

While it may never be possible to completely eliminate failures and breakdowns to work equipment in service, we should gear our thinking toward that goal. Obviously, no machine is completely infallible. as its constant use will eventually wear parts to the point where replacement is required. Manufacturers help us in this respect, because their instruction books and parts manuals usually give us wear tolerances which tell us when to order replacement parts. Training and instruction of all personnel connected with work equipment is a great deterrent to untimely failures.

These people, and especially the machine operators, must be told what to do and how to do it. We must see that they have the proper tools and supplies to do it with, and we must *check* to see that they are doing it properly. They must know their machine, its capabilities, its capacities, and its shortcomings. Operators must be competent, and they must have the correct attitude toward their company, and a genuine concern for the well being and production goals of the machine assigned to them. They must be told all possible about the operation of their machine, and where it fits into the overall picture of the mechanized operation being accomplished. Many roads set up schools or training sessions for their operators and maintainers, and in these sessions they are taught:

(1) Principles of operation and function of each machine.
(2) Correct operation of each machine.
(3) Practical operation of each machine, including actual usage if possible.
(4) Preventive maintenance, including trouble shooting.

In these courses, manufacturer's operation and maintenance manuals should be made available, and in turn this same information should travel with the machine over the road. The use of this literature cannot be overemphasized—it's quite surprising how much one can learn about the machine simply by "reading the directions." (Many current cartoonists and comedians "pooh-pooh" directions furnished with an article, but in our business, these are essential.)

In order to avoid serious failures during the normal work season, machines should be outshopped in the best possible condition and a coat of paint to brighten up the machine is usually warranted at the same time, at little additional cost. Some roads stencil the cost of a machine in a prominent place on it, to make all aware of its importance.

Gang Organization

In order to get the best performance out of our work equipment, careful planning and good gang organization is necessary. Good gang organization not only means purchasing the correct machine for the functions desired, but it means selecting the right man to operate the machine. The operator should be familiar with the function and purpose of the machine, and once he starts it, must give his undivided attention to the job. Also, we must insure correct major overhaul of the machine, and here we have

a job to do in training mechanics to handle this work.

In general, particularly with isolated machines, it is felt that the operator should be given the job of servicing his machine—keeping its fuel tank and radiator filled, checking lube oil level, greasing, and in the case of some machines, keeping its blades sharpened. He should also be allowed to make minor adjustments, as most operators develop a sense which tells them whether or not their machine "sounds" right. The operator is also usually expected to be conversant enough with his machine so that he can consult his parts manual and report to his superior the nature of a breakdown, the sections of the machine affected, and the parts which are required to effect repairs. The important thing to remember is that the operator must know enough about his machine to intelligently report the nature of a trouble, and *training* is again the answer. Also, he must keep all the bolts, nuts, chains and belts tight, and further, which we consider quite important, keep the machine clean.

Field repairmen, and in modern railroading this sort of person is a necessity, can pay for themselves in the prevention of one vital machine breakdown by proper care of the machines under their care and/or supervision. They should do all minor work such as changing spark plugs, ignition points, belts, and chains. They should also make adjustments to clutches, etc., replace parts worn to manufacturer's recommended wear tolerances, and above all, they should be qualified to know when a machine should be scheduled into the shop for major repairs or overhaul.

Field repairmen should have a good supply of personal tools, and the railroad company should supply specialized tools not normally required as part of a mechanic's tool set. Field men should also carry a stock of most used spare parts, such as distributor points, spark plugs, belts, repair links for chains, and other frequently called for items. They should see that the proper lube and hydraulic oils are stocked on the job, and that fueling equipment is kept in good condition, both mechanically and safety-wise.

The right kind of field repairman should keep notes on various machines, so that when talking to supplier's representatives, he can suggest changes or alterations which would make the machine do its job better. We are sure most of you have had the pleasant experience of having some of your suggestions to suppliers show up as modification on next year's model of the same machine. We believe it is quite important that the field repairman have access to supplier's representatives.

A card file, showing the history of each machine, is almost a necessity, and is definitely a valuable set of documents to be used for future reference. This system also can be used to implement the field repairmen's memory when it comes to giving machines proper servicing, and will aid management in determining when a machine should be traded in.

Shopping of machinery rather than doing this job in the field is warranted for general overhauling and for jobs of such duration that the machine should be under cover, and close to a parts depot and machine shop. Unless spare machines and engines are available this procedure is deferred until the off season, if at all possible.

When to call in a manufacturer's service representative is usually a difficult question to answer. As stated earlier, very few failures nowadays can be traced to defective parts, or faulty manufacturing processes. This means that most troubles usually can be repaired by a competent railroad company mechanic, with possibly a phone call to the manufacturer for advice.

Specialized Equipment

Specialized equipment not normally encountered in the average machine definitely warrants an appeal for the appearance of a service representative, at least until an organization gets its mechanics trained in the new techniques involved. Other than that, the committees feels that service representatives' visits can usually be confined to a regular once or twice a year schedule, and to normal "guarantee" calls.

Some of the committee felt that the time has come to set up a specialized maintenance and repair executive. He should, with the chief engineer, set up maintenance standards, schedules, and programs. He could also work with the supplier to see that complete maintenance and servicing information was available for each machine. It is felt that with proper operation of a maintenance program, and the use of good preventive measures, breakdowns and tie-ups can be reduced by as much as fifty per cent, and that labor savings, both in operating and maintenance, can be realized in amounts

up to twenty-five per cent. A long and useful life for each piece of equipment will be another direct benefit of a planned maintenance program.

We, as supervisors, have a large job to do in seeing that our machines are functioning properly, and that they are being serviced properly. The chairman of this committee finds that his biggest problem is having the proper machines (and their allied tools) on hand when and where required, and losing as little time as possible in transit between jobs, or because of indifference to the importance of a machine by his working force. This means that a detailed program must be laid out at the beginning of the season, and that frequent checks must be made to see that this program is adhered to; we must be on top of all breakdowns, or potential breakdowns, so that we can eliminate downtime for our high-priced labor gangs.

Training Programs

A good training program is very essential —only by making our personnel aware of the importance of good management of our maintenance-of-way machinery can we expect to constantly work towards lower unit costs and more quality workmanship. If we have problems, it has been said that training is the most lasting, and best way to solve them. Somebody must *tell* a person what to do, and how to do it—we must never make the mistake of *assuming* he knows.

In this report, we have purposely omitted maintenance of automotive equipment, as it is felt that this is a specialized process which can best be handled by highly trained specialists. Maintainers of this type of equipment (as well as on-track equipment and earthmoving machinery) should be given every opportunity possible to attend suppliers schools, and tours of their manufacturing plants.

One of the objectives of this report, as directed by our special subjects committee, was to report upon recommended frequency of oil changes. It is felt that to do this would only result in a tabulation of manufacturers' recommendations, which can and should be obtained from their instruction books. Another good source of this information is to have a survey on ones' lubrication requirements made by an expert from one of the major oil companies, as lubricants are usually too specialized and varied for one to "pick out of the air."

Frequency of inspections is also a subject open to discussion, and this again should take into account experience, and local conditions. As a very rough yardstick, one mechanic should be able to take care of field inspection, servicing, and minor repairing of about thirty on-track machines in a week, and an inspection period of much over a week will frequently result in lost efficiency or down time of the machinery.

Very briefly then, preventive maintenance, and its results, will save us money and produce more finished work per unit of time is good *training* is done ahead of time, and good *checking* is done constantly. *Checking* is a matter of personal and managerial discipline.

Discussion

The question was raised by J. M. Lowry (SLSW) as to what railroads stenciled the cost of the machines on the units. Chairman Miller replied that he saw these on machines on both the Soo Line and the South Shore Atlantic. He expressed the opinion that this made the operator more conscious of the importance of his work as well as the unit.

Called upon to make a comment on the report, R. R. Gunderson (WM) stated that it was his opinion that machines break down every day and the cause of these breakdowns generally is just plain negligence. H. C. Wiemer (NP) stated that most breakdowns occurred because of too few traveling mechanics on his road. This made it necessary for the operators to try to do it themselves, with poor results. He felt that it was obvious that, with the increasing amount of machines constantly being purchased, more mechanics are necessary. Mr. Gunderson then asked the question as to how highly trained mechanics can be procured, especially with current union agreements. S. K. Mason (TM) volunteered that some good men could be obtained from the incapacitated group. For instance, he said, he had an operator who lost a leg. Being a good operator, the railroad was reluctant to lose his services. As a result, he was put in charge of the machines and kept the records of all oil changes, repairs, etc.

G. W. Benson (CofG) questioned the statement in the report about one man taking care of 30 machines a week. His road, he said, puts this figure at 10. If more than this were added to his servicing, he felt that many of the machines were bound to be neglected. Chairman Miller stated that it is a matter of getting a dedicated man.

For instance, he said, he used to have many failures in machines caused by lack of oil in the crankcases. Since obtaining a man who is a good mechanic, this matter is watched and he has no further breakdowns from this cause.

H. D. Curie (B&O) stated that the operators of the machine could take care of their machines better if they had the proper tools and wrenches on hand. Generally, these were not available with the machine and only the field repair men seemed to have them. He felt that, even if a set of wrenches cost $40, it would be desirable to supply the operators or machines with these sets so that they could keep all bolts tight.

Mr. Gunderson stated that the railroads have a great deal of money invested in work equipment, and that it was worth while to secure good mechanics for its care. He stated that he was able to procure a very good mechanic from one of the manufacturers to take care of the machines of that make.

H. A. Matthews (SL-SF) stated that it was the seniority roster which governed the matter of mechanics on his road. This, he said, made it very difficult to get good men to operate and care for the machines. To this, R. W. Jenkins (SL-SF), agreed. He stated that one good mechanic would go so far as to change out a clutch of a machine, whereas another mechanic, perhaps not so skillful, would report the machine "out of service."

C. E. Wachter (CNR) stated that his road has a training program for equipment operators. An agreement was made with the Brotherhood before setting up this training program and it was agreed that any prospective equipment operator should be a good man.

Mr. Lowry stated it was possible on his road to select the men to be operators, and the railroad had 30 days in which to disqualify the man if not suitable. Usually, he said, an older man couldn't do the work which gave them a chance to get a younger man as operator.

Past Officers

	1891-1892	1892-1893	1893-1894	1894-1895
President	O. J. Travis	H. M. Hall	J. E. Wallace	Geo. W. Andrews
1st V.-Pres.	H. M. Hall	J. E. Wallace	Geo. W. Andrews	W. A. McGonagle
2nd V.-Pres.	J. B. Mitchell	G. W. Hinman	W. A. McGonagle	L. K. Spafford
3rd V.-Pres.	James Stannard	N. W. Thompson	L. K. Spafford	James Stannard
4th V-Pres.	G. W. Hinman	C. T. Fuller	E. D. Hines	Walter G. Berg
Secretary	C. W. Gooch	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	George M. Reid	George M. Reid	George M. Reid	George M. Reid
Executive Members	W. R. Damon	G. W. Andrews	Q. McNab	James Stannard
	G. W. Markley	J. M. Staten	A. S. Markley	James H. Travis
	W. A. McGonagle	J. M. Caldwell	Floyd Ingram	J. H. Cummin
	C. W. McGehee	Q. McNab	James Stannard	R. M. Peck
	G. W. Turner	Floyd Ingram	James H. Travis	J. L. White
	J. E. Wallace	A. S. Markley	J. H. Cummin	A. Shane

	1895-1896	1896-1897	1897-1898	1898-1899
President	W. A. McGonagle	James Stannard	Walter G. Berg	J. M. Cummin
1st V.-Pres.	L. K. Spafford	Walter G. Berg	J. H. Cummin	A. S. Markley
2nd V.-Pres.	James Stannard	J. H. Cummin	A. S. Markley	C. C. Mallard
3rd V.-Pres.	Walter G. Berg	A. S. Markley	G. W. Hinman	W. A. Rogers
4th V.-Pres.	J. H. Cummin	R. M. Peck	C. C. Mallard	J. M. Staten
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	George M. Reid	N. W. Thompson	N. W. Thompson	N. W. Thompson
Executive Members	R. M. Peck	W. O. Eggleston	G. J. Bishop	Wm. S. Danes
	J. L. White	W. M. Noon	C. P. Austin	J. H. Markley
	A. Shane	J. M. Staten	M. Riney	W. O. Eggleston
	A. S. Markley	G. J. Bishop	Wm. S. Danes	R. L. Heflin
	W. M. Noon	C. P. Austin	J. H. Markley	F. W. Tanner
	J. M. Staten	M. Riney	W. O. Eggleston	A. Zimmerman

	1899-1900	1900-1901	1901-1902	1902-1903
President	Aaron S. Markley	W. A. Rogers	W. S. Danes	B. F. Pickering
1st V.-Pres.	W. A. Rogers	W. S. Danes	B. F. Pickering	C. C. Mallard
2nd V.-Pres.	J. M. Staten	B. F. Pickering	A. Shane	A. Shane
3rd V.-Pres.	Wm. S. Danes	A. Shane	A. Zimmerman	A. Zimmerman
4th V.-Pres.	B. F. Pickering	A. Zimmerman	C. C. Mallard	A. Montzheimer
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	N. W. Thompson	N. W. Thompson	N. W. Thompson	N. W. Thompson
Executive Members	T. M. Strain	T. M. Strain	A. Montzheimer	W. E. Smith
	R. L. Heflin	H. D. Cleaveland	W. E. Smith	A. W. Merrick
	F. W. Tanner	F. W. Tanner	A. W. Merrick	C. P. Austin
	A. Zimmerman	A. Montzheimer	C. P. Austin	C. A. Lichty
	H. D. Cleaveland	W. E. Smith	C. A. Lichty	W. O. Eggleston
	A. Montzheimer	A. W. Merrick	W. O. Eggleston	J. H. Markley

	1903-1904	1904-1905	1905-1906	1906-1907
President	A. Montzheimer	C. A. Lichty	J. B. Sheldon	J. H. Markley
1st V.-Pres.	A. Shane	J. B. Sheldon	J. H. Markley	R. H. Reid
2nd V.-Pres.	C. A. Lichty	J. H. Markley	R. H. Reid	J. P. Canty
3rd V.-Pres.	J. B. Sheldon	R. H. Reid	R. C. Sattley	H. Rettinghouse
4th V.-Pres.	J. H. Markley	R. C. Sattley	J. P. Canty	F. E. Schall
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	C. P. Austin	C. P. Austin	C. P. Austin	C. P. Austin
Executive Members	R. H. Reid	W. O. Eggleston	H. Rettinghouse	W. O. Eggleston
	W. O. Eggleston	A. E. Killam	A. E. Killam	A. E. Killam
	A. E. Killam	H. Rettinghouse	J. S. Lemond	J. S. Lemond
	R. C. Sattley	J. S. Lemond	C. W. Richey	C. W. Richey
	H. Rettinghouse	W. H. Finley	H. H. Eggleston	H. H. Eggleston
	J. S. Lemond	C. W. Richey	F. E. Schall	B. J. Sweatt

	1907-1908	1908-1909	1909-1910	1910-1911
President	R. H. Reid	J. P. Canty	H. Rettinghouse	H. Rettinghouse
1st V.-Pres.	J. P. Canty	H. Rettinghouse	J. S. Lemond	F. E. Schall
2nd V.-Pres.	H. Rettinghouse	F. E. Schall	F. E. Schall	A. E. Killam
3rd V.-Pres.	F. E. Schall	J. S. Lemond	A. E. Killam	J. N. Penwell
4th V.-Pres.	W. O. Eggleston	A. E. Killam	J. N. Penwell	L. D. Hadwen
Secretary	S. F. Patterson	S. F. Patterson	C. A. Lichty	C. A. Lichty
Treasurer	C. P. Austin	C. P. Austin	J. P. Canty	J. P. Canty
Executive Members	A. E. Killam	J. N. Penwell	W. Beahan	T. J. Fullem
	J. S. Lemond	Willard Beahan	F. B. Scheetz	G. Aldrich
	C. W. Richey	F. B. Scheetz	L. D. Hadwen	P. Swenson
	T. S. Leake	W. H. Finley	T. J. Fullem	G. W. Rear
	W. H. Finley	L. D. Hadwen	G. Aldrich	W. O. Eggleston
	J. N. Penwell	T. J. Fullem	P. Swenson	W. F. Steffens

	1911-1912	1912-1913	1913-1914	1914-1915
President	F. E. Schall	A. E. Killam	J. N. Penwell	L. D. Hadwen
1st V.-Pres.	A. E. Killam	J. N. Penwell	L. D. Hadwen	G. Aldrich
2nd V.-Pres.	J. N. Penwell	L. D. Hadwen	G. Aldrich	G. W. Rear
3rd V.-Pres.	L. D. Hadwen	T. J. Fullem	G. W. Rear	C. E. Smith
4th V.-Pres.	T. J. Fullem	G. Aldrich	C. E. Smith	E. B. Ashby
Secretary	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Treasurer	J. P. Canty	J. P. Canty	J. P. Canty	F. E. Weise
Executive Members	G. Aldrich	G. W. Rear	W. F. Steffens	W. F. Steffens
	P. Swenson	W. F. Steffens	E. B. Ashby	S. C. Tanner
	G. W. Rear	E. B. Ashby	S. C. Tanner	Lee Jutton
	W. F. Steffens	C. E. Smith	Lee Jutton	F. F. Strouse
	E. B. Ashby	S. C. Tanner	W. F. Strouse	C. R. Knowles
	W. O. Eggleston	Lee Jutton	C. R. Knowles	A. Ridgway

	1915-1916	1916-1917	1917-1918	1918-1919
President	G. W. Rear	C. E. Smith	S. C. Tanner	Lee Jutton
1st V.-Pres.	C. E. Smith	E. B. Ashby	Lee Jutton	F. E. Weise
2nd V.-Pres.	E. B. Ashby	S. C. Tanner	F. E. Weise	W. F. Strouse
3rd V.-Pres.	S. C. Tanner	Lee Jutton	W. F. Strouse	C. R. Knowles
4th V.-Pres.	Lee Jutton	F. E. Weise	C. R. Knowles	A. Ridgway
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Executive Members	F. E. Weise	W. F. Strouse	A. Ridgway	J. S. Robinson
	W. F. Strouse	C. R. Knowles	J. S. Robinson	J. P. Wood
	C. R. Knowles	A. Ridgway	J. P. Wood	A. B. McVay
	A. Ridgway	J. S. Robinson	D. C. Zook	J. H. Johnston
	J. S. Robinson	J. P. Wood	A. B. McVay	E. T. Howson
	J. P. Wood	D. C. Zook	J. H. Johnston	C. W. Wright

	1919-1920	1920-1921	1921-1922	1922-1923
President	F. E. Weise	W. F. Strouse	C. R. Knowles	Arthur Ridgway
1st V.-Pres.	W. F. Strouse	C. R. Knowles	A. Ridgway	J. P. Wood
2nd V.-Pres.	C. R. Knowles	A. Ridgway	J. S. Robinson	J. S. Robinson
3rd V.-Pres.	A. Ridgway	J. S. Robinson	J. P. Wood	C. W. Wright
4th V.-Pres.	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.			F. E. Weise	F. E. Weise
Directors	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
	A. B. McVay	A. B. McVay	J. H. Johnston	Maro Johnson
	J. H. Johnston	G. A. Manthey	E. K. Barrett	O. F. Dalstrom
	E. T. Howson	E. T. Howson	F. C. Baluss	S. D. Corey
	C. W. Wright	J. H. Jonhston	Maro Johnson	W. B. Hotson
	G. A. Manthey	E. K. Barrett	O. F. Dalstrom	P. N. Nelson

	1923-1924	1924-1925	1925-1926	1926-1927
President	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
1st V.-Pres.	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
2nd V.-Pres.	C. W. Wright	E. T. Howson	F. C. Baluss	Maro Johnson
3rd V.-Pres.	E. T. Howson	F. C. Baluss	Maro Johnson	J. S. Huntoon
4th V.-Pres.	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.	F. E. Weise	F. E. Weise	F. E. Weise	F. E. Weise
Directors	S. T. Corey	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
	W. B. Hotson	A. I. Gauthier	W. B. Hotson	E. L. Sinclair
	P. N. Nelson	E. L. Sinclair	P. N. Nelson	O. F. Dalstrom
	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	W. T. Krausch
	A. I. Gauthier	W. B. Hotson	E. L. Sinclair	R. C. Bardwell
	E. L. Sinclair	P. N. Nelson	O. F. Dalstrom	H. I. Benjamin

	1927-1928	1928-1929	1929-1930	1930-1934
President	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
1st V.-Pres.	Maro Johnson	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
2nd V.-Pres.	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	H. I. Benjamin
3rd V.-Pres.	C. S. Heritage	A. I. Gauthier	H. I. Benjamin	W. T. Krausch
4th V.-Pres.	A. I. Gauthier	H. I. Benjamin	W. T. Krausch	T. H. Strate
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.	F. E. Weise	F. E. Weise		
Directors	W. T. Krausch	R. C. Henderson	G. A. Rodman	E. C. Neville
	R. C. Bardwell	J. S. Ekey	W. A. Batey	H. H. Best
	H. I. Benjamin	T. H. Strate	F. W. Hillman	J. E. King
	R. C. Henderson	G. A. Rodman	E. C. Neville	A. B. Scowden
	T. H. Strate	W. A. Batey	H. H. Best	W. A. Batey
	J. S. Ekey	F. W. Hillman	J. E. King	L. C. Smith

	1934-1935	1935-1936	1936-1937	1937-1938
President	H. I. Benjamin	T. H. Strate	E. C. Neville	C. M. Burpee
1st V.-Pres.	T. H. Strate	E. C. Neville	C. M. Burpee	F. H. Masters
2nd V.-Pres.	E. C. Neville	C. M. Burpee	F. H. Masters	W. S. Lacher
3rd V.-Pres.	A. B. Scowden	F. H. Masters	C. A. J. Richards	C. A. J. Richards
4th V.-Pres.	W. R. Roof	C. A. J. Richards	W. S. Lacher	F. H. Cramer
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Directors	C. M. Burpee	A. L. McCloy	W. R. Roof	B. R. Meyers
	W. A. Batey	R. P. Luck	T. P. Soule	G. S. Crites
	L. C. Smith	H. H. Best	F. H. Cramer	R. E. Dove
	C. A. J. Richards	W. R. Roof	B. R. Meyers	T. P. Soule
	A. L. McCoy	T. P. Soule	G. S. Crites	A. Chinn
	R. P. Luck	F. H. Cramer	R. E. Dove	L. G. Byrd

	1938-1939	1939-1940	1940-1941	1941-1942
President	Armstrong Chinn	A. E. Bechtelheimer	H. M. Church	R. E. Dove
1st V.-Pres.	F. H. Cramer	F. H. Cramer	R. E. Dove	F. H. Soothill
2nd V.-Pres.	A. E. Bechtelheimer	H. M. Church	F. A. Soothill	G. S. Crites
3rd V.-Pres.	H. M. Church	R. E. Dove	G. S. Crites	A. M. Knowles
4th V.-Pres.	R. E. Dove	F. H. Soothill	A. M. Knowles	N. D. Howard
Sec.-Treas.	C. A. Lichty	C. A. Lichty		
Secretary	.....	.....	F. O. Whiteman	A. G. Shaver
Treasurer	.....	.....	F. E. Weise	F. E. Weise
Directors	L. G. Byrd	B. R. Meyers	N. D. Howard	R. E. Caudle
	W. R. Ganser	W. Walkden	L. G. Byrd	I. A. Moore
	F. H. Soothill	A. S. Krefting	K. L. Miner	W. A. Sweet
	B. R. Meyers	A. M. Knowles	R. E. Caudle	J. L. Varker
	W. Walkden	L. G. Byrd	I. A. Moore	L. E. Peyser
	A. S. Krefting	K. L. Miner	W. A. Sweet	Martin Meyer

	1942-1943	1943-1944	1944-1945	1945-1946
President	G. S. Crites	J. L. Varker	J. L. Varker	N. D. Howard
1st V.-Pres.	R. E. Caudle	R. E. Caudle	R. E. Caudle	F. G. Campbell
2nd V.-Pres.	A. M. Knowles	N. D. Howard	N. D. Howard	J. S. Hancock
3rd V.-Pres.	N. D. Howard	F. G. Campbell	F. G. Campbell	E. H. Barnhart
4th V.-Pres.	J. L. Varker	J. S. Hancock	J. S. Hancock	W. F. Martens
Secretary	A. G. Shaver†	Elinor V. Heffern	Elise LaChance	Elise LaChance
	Lorene Kindred‡			
	Elinor V. Heffern			
Treasurer	F. E. Weise	C. R. Knowles	C. R. Knowles	C. R. Knowles
Treasurer Emeritus		F. E. Weise	F. E. Weise	
Directors	M. Meyer	W. F. Martens	W. F. Martens	A. B. Chapman
	L. E. Peyser	A. L. McCloy	A. L. McCloy	W. A. Huckstep
	K. L. Miner	L. C. Winkelhaus	L. C. Winkelhaus	F. R. Spofford
	F. G. Campbell	E. H. Barnhart	E. H. Barnhart	Guy E. Martin
	J. S. Hancock	A. B. Chapman	A. B. Chapman	B. R. Meyers
	L. C. Winkelhaus	L. E. Peyser	L. E. Peyser	L. E. Peyser

†To November 1, 1942
‡To February 1, 1943

	1946-1947	1947-1948	1948-1949	1949-1950
President	F. G. Campbell	J. S. Hancock	E. H. Barnhart	W. F. Martens
1st V.-Pres.	J. S. Hancock	E. H. Barnhart	W. F. Martens	W. A. Huckstep
2nd V.-Pres.	E. H. Barnhart	W. F. Martens	W. A. Huckstep	Guy E. Martin
3rd V.-Pres.	W. F. Martens	W. A. Huckstep	Guy E. Martin	F. R. Spofford
4th V.-Pres.	W. A. Huckstep	G. E. Martin	F. R. Spofford	Lee Mayfield
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	C. R. Knowles	C. R. Knowles	L. C. Winkelhaus	L. C. Winkelhaus
Directors	Guy E. Martin	H. M. Harlow	Lee Mayfield	H. M. Harlow
	B. R. Meyers	H. B. Christianson	F. M. Misch	V. E. Engman
	L. E. Peyser	F. R. Spofford	W. D. Gibson	G. W. Benson
	H. M. Harlow	Lee Mayfield	H. M. Harlow	F. M. Misch
	H. B. Christianson	Franz M. Misch	V. E. Engman	L. R. Morgan
	F. R. Spofford	W. D. Gibson	G. W. Benson	J. A. Jorlett

	1950-1951	1951-1952	1952-1953	1953-1954
President	W. A. Huckstep	Guy E. Martin	F. R. Spofford	Lee Mayfield
1st V.-Pres.	Guy E. Martin	F. R. Spofford	Lee Mayfield	H. M. Harlow
2nd V.-Pres.	F. R. Spofford	Lee Mayfield	H. M. Harlow	J. A. Jorlett
3rd V.-Pres.	Lee Mayfield	H. M. Harlow	J. A. Jorlett	R. R. Gunderson
4th V.-Pres.	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	F. M. Misch	M. H. Dick	W. H. Huffman	M. H. Dick
	L. R. Morgan	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells
	J. A. Jorlett	J. F. Warrenfells	B. M. Stephens	G. Switzer
	M. H. Dick	W. H. Huffman	M. H. Dick	B. M. Stephens
	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells	W. H. Bunge
	J. F. Warrenfells	B. M. Stephens	G. Switzer	E. R. Schlaf

	1954-1955	1955-1956	1956-1957	1957-1958
President	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
1st V.-Pres.	J. A. Jorlett	R. R. Gunderson	W. H. Huffman	M. H. Dick
2nd V.-Pres.	R. R. Gunderson	W. H. Huffman	M. H. Dick	B. M. Stephens
3rd V.-Pres.	W. H. Huffman	M. H. Dick	B. M. Stephens	H. D. Curie
4th V.-Pres.	M. H. Dick	B. M. Stephens	H. D. Curie	
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	B. M. Stephens	J. F. Warrenfells	W. H. Bunge	G. W. Benson
	W. H. Bunge	H. D. Curie	E. R. Schlaf	J. M. Lowry
	E. R. Schlaf	J. M. Lowry	G. W. Benson	H. A. Matthews
	J. F. Warrenfells	W. H. Bunge	J. M. Lowry	T. M. von Sprecken
	H. D. Curie	E. R. Schlaf	T. M. von Sprecken	W. H. Bunge
	J. M. Lowry	G. W. Benson	H. A. Matthews	E. R. Schlaf

	1958-1959
President	M. H. Dick
1st V.-Pres.	B. M. Stephens
2nd V.-Pres.	H. D. Curie
3rd V.-Pres.	G. W. Benson
Secretary	Ruth Weggeberg
Treasurer	L. C. Winkelhaus
Directors	J. M. Lowry
	R. C. Baker
	W. H. Bunge
	E. R. Schlaf
	H. A. Matthews
	M. J. Hubbard

CONSTITUTION

ARTICLE I.

NAME

Section 1. This association shall be known as the American Railway Bridge & Building Association.

ARTICLE II.

OBJECT

Section 1.** The object of this association shall be the advancement of knowledge pertaining to the design, construction and maintenance of railway bridges, buildings, water service facilities, and other structures, by investigation, reports and discussions.

Section 2. The association shall neither indorse nor recommend any particular devices, trade marks or materials, nor will it be responsible for any opinions expressed in papers, reports or discussions unless the same have received the endorsement of the association in regular session.

ARTICLE III.

MEMBERSHIP

Section 1. The membership of this association shall be divided into five classes, viz: Members, life members, associate, honorary and junior members.*

Section 2.** A member shall be a person in a position above rank of gang foreman in connection with roadway bridge, building and water service work, or in the employ of a public regulatory body, a professor of engineering in a college, an engineering editor, or a government or private timber expert. Any person desirous of becoming a member shall make application upon the form prescribed by the executive committee, setting forth his name, age, residence and practical experience. He shall furnish at least three references to whom he is personally known. Applicants may be voted into membership at any regular executive meeting or by letter ballot of the executive committee, a majority vote being necessary in either instance.

Section 3.** To be eligible for a life membership a member must have belonged to the association for at least 15†† years and in general must have retired from active railway service due to age or physical disability. He shall have all the privileges of active membership, except the holding of office, and shall not be required to pay annual dues. The transfer from membership to life membership shall be made in the same manner as the election of members, as prescribed in Section 2, of this Article.

Section 4. Associates shall be responsible persons who are not eligible as members, whose pursuits or attainments qualify them to co-operate with members in the study and development of improved practices in the construction and maintenance of bridges, buildings and water facilities. They shall have all the rights of members except of voting and holding office. They shall be elected in the manner prescribed for members, in Section 2, of this Article.

Section 5. Honorary members shall be chosen from persons who have attained acknowledged eminence in some branch of engineering or railway service. Their number shall be limited to ten. Honorary members shall be proposed by not less than six active members and shall be elected by the unanimous vote of the members

---

*Amended October 16, 1941.
**Amended September 20, 1948.
††Amended March 10, 1958.

present at a regular meeting. They shall have all the rights of active members except that of holding office and shall be exempt from the payment of dues.

Section 6. A junior member shall be a person who is a graduate of a recognized engineering school, or who has been employed for at least two years in the design, maintenance or construction of railway bridges, buildings or structures. Applicants shall be at least 21 years of age and they shall be elected in the manner prescribed for members, in Section 2 of this article. Juniors shall have all the rights of members except that of holding office. When the attainments of a Junior are such as to qualify him as a member, he may apply for promotion and the Executive Committee shall authorize such promotion when qualifications warrant the action. Unless a Junior is promoted, his membership shall cease automatically when he becomes 28 years of age.*

Section 7. Any member guilty of conduct unbecoming to a railroad officer and a member of this association, or who shall refuse to comply with the rules of this association, shall forfeit his membership on a two-thirds vote of the executive committee.

Section 8. Membership shall continue until written resignation is received by the secretary, unless member has been previously expelled, or dropped for non-payment of dues in accordance with Section 1 of Article VII.

Section 9.** Only active members shall hold office in this association, and only active and life members shall be entitled to vote in the election of officers.

ARTICLE IV.

OFFICERS

Section 1†. The officers of this association shall be a president, three vice-presidents, a secretary, a treasurer and six directors who with the most recent past president shall constitute the executive committee.

Section 2. The past presidents of this association, previous to the most recent past president, who continue to be members, shall be privileged to attend all meetings of the executive committee, of which meetings they shall receive due notice, and be permitted to discuss all questions and to aid said committee by their advice and counsel; but said past presidents shall not have a right to vote, unless called upon to fill a quorum.

Section 3. Vacancies in any office shall be filled for the unexpired term by the executive committee without delay.

ARTICLE V.

EXECUTIVE COMMITTEE

Section 1.** The executive committee shall manage the affairs of the association and shall have full power to control and regulate all matters not otherwise provided for in the constitution and by-laws and shall exercise general supervision over the financial interests of the association, and make all necessary purchases and contracts required to conduct the general business of the association, but shall not have the power to render the association liable for any debt beyond the amount then in the treasury plus accounts receivable and not subject to other prior liabilities. All appropriations for special purposes must be acted upon at a regular meeting of the association.

Section 2. Meetings of the executive committee may be called by a majority of the members of the committee, providing 10 days' notice is given members by mail.

Section 3. Five members of the executive committee shall constitute a quorum for the transaction of business.

ARTICLE VI.

ELECTION OF OFFICERS AND TENURE OF OFFICE

Section 1. Except as otherwise provided, the officers shall be elected at the regular annual meeting of the association and the election shall not be postponed except by unanimous consent of the members present at said annual meeting. The

*Amended October 16, 1941.
**Amended September 20, 1948.
†Amended September 21, 1957.

election shall be by ballot, a majority of the votes cast being required for election. Any active member of the association not in arrears for dues shall be eligible for office, but the president shall not be eligible for reëlection.

Section 2‡. The president, three vice-presidents, secretary and treasurer shall hold office for one year and the directors for three years, two directors being elected each year. All officers retain their office until their successors are elected and installed. A director elected for a three-year term shall not be eligible to serve two consecutive terms.

Section 3.† The term of office of the secretary and the treasurer may be terminated at any time by a two-thirds vote of the executive committee. Their compensation shall be fixed by a majority vote of the executive committee.

The secretary shall also serve as secretary of the executive committee.

Section 4. The secretary and the treasurer shall be required to give bond in an amount to be fixed by the executive committee.

ARTICLE VII.

MEMBERSHIP FEE AND DUES

Section 1.† Every member upon joining this association shall pay to the secretary an entrance fee and dues as prescribed by the executive committee. No member in arrears for annual dues shall be entitled to vote at any election and any member more than one year in arrears may be stricken from the list of members at the discretion of the executive committee.

Section 2.‡ A person stricken from the list of members because of non-payment of dues, upon written application may be reinstated as a member in his former class without loss of privileges, either upon payment of all back dues (which must accompany application) or at the discretion of the Executive Committee voting in the manner prescribed in Section 2, Article III.

ARTICLE VIII.*

LOCAL SECTIONS

Section 1.** Upon the application of ten or more members of the association residing in the same geographical district, or having offices therein, the executive committee shall organize a local section for that district, to which all members in that district shall be eligible. Such local section shall admit to active membership only members in good standing. It shall hold not less than two meetings each year, and shall be governed by such constitution and by-laws not inconsistent with the constitution of this association as the section membership may adopt and the executive committee of the association approve.

Section 2. The parent association shall not be put under any obligation, either financial or in the matter of policy or opinion, by any local section.

ARTICLE IX.

AMENDMENTS

Section 1. This constitution may be amended at any regular meeting by a two-thirds vote of the members present, provided that notice of the proposed amendment or amendments has been sent to the members at least 30 days previous to said regular meeting.

BY-LAWS

TIME OF MEETING

1.** The regular meeting of this association shall convene annually during the month of September, the exact date to be fixed by the Executive Committee.

PLACE OF MEETING

2.** The place of holding the annual convention shall be Chicago, Ill.

---

†Amended October 17, 1940.
*Article adopted 1922.
**Amended September 20, 1948.
‡Amended September 21, 1957.

3. It shall lie within the power of the executive committee to change the location or time of the meeting if it becomes apparent that it is for the best interests of the association.

QUORUM

4. At the regular meeting of the association, 15 or more members shall constitute a quorum.

**DUES

5. The annual dues, for the fiscal year ending August 31, and payable in advance, shall be as follows:*

Members, $5.00; Associate Members, $4.00; Junior Members, $2.50.

DUTIES OF OFFICERS

6.† The president shall have general supervision over the affairs of the association. He shall preside at all meetings of the association and of the executive committee; shall appoint all committees not otherwise provided for, and shall be ex-officio member of all committees. He shall with the secretary sign all contracts or other written obligations of the association which have been approved by the executive committee. He shall render a detailed report at least three times during the year to the members of the executive committee, showing the financial condition of the association and its activities.

At the annual meeting the president shall present a report containing a statement of the general conditions of the association.

7. The vice-presidents in order of seniority shall preside at meetings in the absence of the president and discharge his duties in case of a vacancy in his office.

8.† It shall be the duty of the secretary to keep a correct record of the proceedings of all meetings of this association, and of all accounts, between this association and its members; to collect all moneys due the association, and deposit the same in the name of the association. He shall pay all bills when properly certified and approved by the president and the treasurer, and make such reports as may be called for by the executive committee. He shall also perform such other duties as the association may require.

9.‡ The treasurer shall have charge of the funds, check all deposits as made by the secretary, sign all checks after they have been approved by the president, and invest all funds not needed for current expenses as directed by the executive committee. He shall report at each annual meeting on the condition of the finances.

NOMINATING COMMITTEE

10.# After each annual meeting the president shall appoint a committee consisting of five members. Two Past Presidents shall be members of this committee, one of whom shall act as Chairman. No other officers of the Association shall be appointed to this committee. This committee shall prepare a list of names of nominees for officers to be voted on at the next annual convention in accordance with ARTICLE VI of the Constitution, said list to be read at the business session of said convention. Nothing in this section shall be construed to prevent any member making further nominations.

AUDITING COMMITTEE

11.‡ Prior to each annual meeting the president shall appoint a committee of three members, not officers of the association, whose duty it shall be to examine the accounts and vouchers of the secretary and the treasurer and certify as to the correctness of their accounts.

COMMITTEE ON SUBJECTS FOR DISCUSSION

12. After each annual meeting the president shall appoint a committee whose duty it shall be to prepare a list of subjects for investigation to be submitted for approval at the next convention.

---

†Amended October 17, 1940.
‡Adopted October 17, 1940.
*Amended October 16, 1941.
**Amended September 20, 1948.
#Amended December 4, 1950.

COMMITTEE ON INVESTIGATION

13. After the association has adopted the list of subjects for investigation the president for the succeeding year shall appoint the committees who shall prepare the subjects for report and discussion. He may also appoint individual members to prepare reports on special subjects, or to report on any special or particular subject.

PUBLICATION COMMITTEE

14. After each annual meeting the executive committee shall appoint a publication committee consisting of three active members whose duty it shall be to coöperate with the secretary in the issuing of the publications of the association. The assignment of this committee shall be such that at least one member shall have served on the committee during the previous year.

ORDER OF BUSINESS

15.† Call to order by president.
Opening prayer or invocation.
President's address.
Report of secretary.
Report of treasurer.
Appointment of special committees.
Reports of standing committees and presentation of papers.
Unfinished business.
New business.
Election of officers.
Installation of officers.
Adjournment.

DECISIONS

16. The votes of a majority of the members present shall decide any questions, motion or resolution which shall be brought before the association, unless otherwise provided. Unless specifically provided herein otherwise, all discussions shall be governed by Robert's rules of order.

AMENDMENTS

17.† The By-Laws can be amended by a two-thirds vote of those present at any regularly called Executive Committee Meeting.

---

†Amended September 20, 1948.

DIRECTORY OF MEMBERS

as of March 1, 1960

(Figure after each name indicates year when member joined the association)

* Indicates Junior Member

HONORARY MEMBERS

Barnhart, E. H., (Ret.), Div. Engr., B. & O., St. Petersburg, Fla. (1941)
Bechtelheimer, A. E., (Ret.) Br. Engr., C. & N. W., Chicago, Ill. (1920)
Budd, Ralph, (Ret.) Pres., C. B. & Q., Santa Barbara, Calif. (1927)
Buford, C. H., (Ret.), Pres., C. M. St. P. & P., St. Petersburg, Fla. (1946)
Crites, G. S., (Ret.) Div. Engr., B. & O., Baltimore, Md. (1912)
Howard, N. D., Exec. Secy., A. R. E. A., Chicago, Ill. (1926)
Strate, T. H., (Ret.) Div. Engr., C. M. St. P. & P., San Ysidro, Calif. (1918)
Vandenburgh, E. C., (Ret.) Ch. Engr., C. & N. W., Chicago, Ill. (1925)

ACTIVE MEMBERS

A

Abel, N. M., Asst. Engr. Const., P. R. R., Trenton, N. J. (1957)
Adkins, H. O., Supv. Struc., D. & R. G. W., Denver, Colo. (1953)
Albert, E. A., Br. Insp., I. C., Chicago, Ill. (1956)
Allen, W. V., Asst. Supv. B. & B., C. & O., Huntington, W. Va. (1959)
Alley, F. T., Asst. B. & B. Supv., St. L. S. W., Tyler, Tex. (1955)
Anderson, A., Engr. Grade Cross., N. Y. C., Chicago, Ill. (1947)
Anderson, A. C., Gen. B. & B. Fore., D. M. & I. R., Two Harbors, Minn. (1952)
Anderson, M. P., Ch. Engr., Monon, Lafayette, Ind. (1959)
Armstrong, W. F., Engr. Bldg., C. & N. W., Chicago, Ill. (1947)
Atkins, A. I., Bldg. Struc. Engr., B. & O., Baltimore, Md. (1959)
Atkinson, T. J., Supv. Struc., P. R. R., Pittsburgh, Pa. (1947)

B

Babbitt, J. H., Div. Engr., B. & O., Indianapolis, Ind. (1946)
Babcock, D. L., Supv. B. & B., C. & N. W., Milwaukee, Wis. (1953)
Bach, S. A., Asst. Engr., M. P., Kansas City, Mo. (1955)
Baker, F. A., Asst. Gen. Br. Insp., S. P., San Francisco, Calif. (1955)
Baker, G. A., Trstmn., G. C. & S. F., Ft. Worth, Tex. (1958)
Baker, R. C., Engr. Struc., C. & E. I., Danville, Ill. (1940)
Baker, R. E., Asst. B. & B. Supv., Monon, Bloomington, Ill. (1959)
Bangs, E. L., Gen. Br. Insp., C. & N. W., Chicago, Ill. (1957)
Barhan, L. M., Tr. Mast.-Rdm., N. P., Mandan, N. D. (1956)
Barke, W. B., Asst. Supv. B. & B., G. N., Wenatchee, Wash. (1958)
Barnes, J. A., Asst. to Asst. Ch. Engr. Maint., C. & N. W., Chicago, Ill. (1957)
Barr, H. L., Div. Engr., C. & N. W., Boone, Iowa (1938)
Barranco, S. J., Supv. Struc., P. R. R., Cincinnati, Ohio (1951)
Barsema, M., Asst. B. & B. Supv., C. & N. W., Chicago, Ill. (1958)
Bartlett, E. W., Detailer, C. M. St. P. & P., Chicago, Ill. (1959)
Bassinger, F. O., Engr. P. & H., N. Y. N H. & H., New Haven, Conn. (1959)
Bateman, E. F., B. & B. Supv., U. P., Salt Lake City, Utah (1958)

Beam, Y. C., Mast. Carp., S. A. L., Americus, Ga. (1945)
Beatty, A. G., Supv. Scl. & Wk. Equip., C. & N. W., Chicago, Ill. (1957)
Beaver, J. F., Asst. Ch. Engr., Sou., Washington, D. C. (1950)
Becker, A. L., Eng. Struc., M. P., St. Louis, Mo. (1957)
Beckert, R. C., Drafts., P. R. R., Chicago, Ill. (1959)
Beeder, R. H., Ch. Engr.-Sys., A. T. & S. F., Chicago, Ill. (1958)
Bell, D. V., Mast. Carp., B. & O., Dayton, Ohio (1957)
Benson, G. W., Div. Engr., C. of G., Macon, Ga. (1940)
Benson, O. C., Asst. Engr. M. of W., B. & M., Boston, Mass. (1952)
Beringer, M. A., Supt. Br. Erec., I. C., Chicago, Ill. (1929)
Bertel, D. J., Div. Engr., M. P., DeQuincy, La. (1957)
Best, R. A., Engr.-Insp., U. P., Kansas City, Mo. (1958)
Billings, C. N., Asst. Ch. Engr., T. & N. O., Houston, Tex. (1959)
Billingsley, C. C., Asst. Mast. Carp., S. A. L., Raleigh, N. C. (1959)
Billmeyer, E. D., Br. & Struc. Engr., W. M., Baltimore, Md. (1955)
Bird, H. F., Dist. Engr. Struc., N. Y. C., Syracuse, N. Y. (1959)
Bisbee, R. D., Div. Engr., P. & S. F., Slaton, Tex. (1947)
Bishop, I. A., Mast. Carp., S. A. L., Raleigh, N. C. (1955)
Black, A. R., Spec. Rep., T. & N. O., Houston, Tex. (1953)
Blake, B. D., Res. Engr., C. R. I. & P., El Reno, Okla. (1959)
Blake, J. E., Jr., Supv. Struc., P. R. R., Williamsport, Pa. (1953)
Bleul, G. J., Asst. Engr. Bldg., B. & O., Baltimore, Md. (1959)
Block, M., Asst. to Ch. Engr., I. C., Chicago, Ill. (1948)
Bober, H., B. & B. Engr., G. M. & O., Mobile, Ala. (1947)
Bodie, B. V., Vice Pres. & Gen. Mgr., G. M. & O., Mobile, Ala. (1951)
Boehling, H. A., Jr., Asst. Supv. Br. Erect.-Sys., C. & O., Huntington, W. Va. (1948)
Bogle, W. H., Engr. M of W., P. T. R. A., Houston, Tex. (1959)
Boling, E. C., Supv. B. & B., N. S., Raleigh, N. C. (1950)
Bolling, J. P., Div. Engr., L. & N., Latonia, Ky. (1959)
Bolte, W. R., Motor Car Shop Fore., K. C. S., Pittsburg, Kans. (1959)
Bonnevier, C. J., Engr. Bldg., C. B. & Q., Chicago, Ill. (1957)
Booth, H. E., B. & B. Mast., C. N., Regina, Sask., Can. (1957)
Born, J. O., Prin, Asst. Engr., M. C., Portland, Me. (1956)
Bost, M. R., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1959)
*Bowen, R. L., Rdmn., D. & H., Albany, N. Y. (1957)
Bowman, H. A., Mast. Carp., F. W. & D., Wichita Falls, Tex. (1953)
Bowman, J. R., Supt. B. & B., T. R. R. A. of St. L., St. Louis, Mo. (1958)
Bowman, R. M., Asst. Supv. Struc., P. R. R., Pittsburgh, Pa. (1954)
Bradfield, R. G., Engr., P. R. R., Chicago, Ill. (1957)
Brandimarte, J. J., Jr., Supv. Struc., P. R. R., Pittsburgh, Pa. (1947)
Bredfeldt, C., Ch. Drafts., C. M. St. P. & P., Chicago, Ill. (1955)
Brenton, G. W., Gen. Supv. B. & B., D. & R. G. W., Denver, Colo. (1957)
Brouse, R. G., Sr., Mast. Carp., C. B. & Q., Chicago, Ill. (1951)
Brown, E. J., Ch. Engr., C. B. & Q., Chicago, Ill. (1955)
Brown, G. W., Supv. Auto. & Wk. Equip., T. & N. O., Houston, Tex. (1955)
Brown, K. R., B. & B. Supv., C. & E. I., Salem, Ill. (1956)
Brown, L. W., B. & B. Supv., C. & O., Peru, Ind. (1951)
Brown, W. S., Engr. B. & B. Maint., B. & O., Baltimore, Md. (1959)
Bruns, M. W., Br. Engr., T. R. R. A. of St. L., St. Louis, Mo. (1954)
Buckmaster, W. A., Asst. Div. Engr., B. & O. C. T., Chicago, Ill. (1951)
Bunch, A. H., Gen. Fore. B. & B.-W. S., St. L.-S. F., Ft. Smith, Ark. (1951)
Burch, E. E., Br. Engr., C. M. St. P. & P., Chicago, Ill. (1945)
Burford, A. E., Supv. B. & B., I. C., Memphis, Tenn. (1947)
Burkel, J. N., Drafts., M. P., St. Louis, Mo. (1951)
Burner, P. D., Asst. Gen. Supv. Rdwy., Wk. Equip., W. P., Oakland, Calif. (1953)
Burpee, C. M., Exec. Dir., Amer. Wood Pres. Inst., Chicago, Ill. (1930)
Burrows, C. D., Mast. Carp., B. & O., Baltimore, Md. (1946)
Butterfield, S. E., B. & B. Supv., C. G. W., St. Paul, Minn. (1959)

C

Caines, W. W., Supv. B. & B., C. & O., Huntington, W. Va. (1938)
Caldwell, F. O., Asst. Mast. Carp., S. A. L., Jacksonville, Fla. (1959)
Calhoun, F. B., Asst. to Ch. Engr., T. & N. O., Houston, Tex. (1959)
Camelle, E. J., B. & B. Supv., T. & N. O., Lafayette, La. (1954)
Cameron, W. M., Ch. Carp., C. M. St. P. & P., Milwaukee, Wis. (1955)

Campbell, H. G., Jr., Asst. Supv. Struc., P. R. R., Harrisburg, Pa. (1956)
Campbell, J. E., Gen. Supv. M. of W.-S. Weld., W. P., Oakland, Calif. (1954)
Campbell, J. G., Gen. Supt., D. & M., Tawas City, Mich. (1959)
Cannon, B. E., Engr. Struc., Alaska, Anchorage, Alaska (1959)
Cantrell, C. F., Jr., Paint. Fore., I. C., Vicksburg, Miss. (1956)
Carlson, A. W., Engr. Br. & Struc., W. P., San Francisco, Calif. (1955)
Carpenter, G. B., Trav. Br. Insp., Erie, Lakewood, N. Y. (1959)
Carpenter, R. H., Engr. M. of W., M. P., St. Louis, Mo. (1956)
Carr, R. D., Gen. Fore. B. & B., Jack. Term., Jacksonville, Fla. (1958)
Carter, J. W., B. & B. Supv., Virginian, Roanoke, Va. (1947)
Carter, T. S., Ch. Engr., M. K. T., Dallas, Tex. (1954)
Cary, N. M., Gen. Div. Engr., Sou., Atlanta, Ga. (1953)
Cash, E. E., Supv. Maint., Camas Prairie, Lewiston, Ida. (1953)
Caywood, J. A., Engr. M. of W., B. & O., Baltimore, Md. (1959)
Celander, H. W., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1959)
Chaffin, E. S., Supv. B. & B., N. & W., Crewe, Va. (1957)
Chamberlain, H. L., Supv. Struc., P. R. R., Indianapolis, Ind. (1956)
Chamberlain, P. C., Asst. to Engr. Struc., Erie, Cleveland, Ohio (1941)
Chaney, A. B., (Ret.), Engr. M. of W., M. P., Little Rock, Ark. (1947)
Chapman, W. E., Ch. Engr.-Maint., C. of G., Savannah, Ga. (1959)
Charvat, A. W., Engr. Arch., C. R. I. & P., Chicago, Ill. (1959)
Cheney, R. R., Asst. Supv. Br. Maint., C. M. St. P. & P., Chicago, Ill. (1953)
Cheselski, F. S., Asst. Supv. B. & B., G. N., Grand Forks, N. D. (1956)
Christian, J. E., Asst. Supv. B. & B.-W. Sup., C. & O., Rainelle, W. Va. (1959)
Clark, A., Engr. B. & B., B. & O., Baltimore, Md. (1959)
Clark, K. L., Div. Engr., C. M. St. P. & P., Chicago, Ill. (1939)
Clark, W. H., Div. Engr., P. & S. F., Amarillo, Tex. (1959)
Clarke, R. J., Area Engr. Struc., P. R. R., Philadelphia, Pa. (1956)
Clouette, H. F., Asst. B. & B. Supv., N. W. P., San Rafael, Calif. (1953)
Cockerham, E. C., Supv. B. & B., L. & N., Nashville, Tenn. (1958)
Cole, G., Gen. Fore. B. & B., A. T. & S. F., Emporia, Kans. (1949)
Collier, P. B., Supt. of Scl., M. P., St. Louis, Mo. (1938)
Collings, J. E., Ch. Carp., C. M. St. P. & P., Aberdeen, S. D. (1953)
Collins, A. T., Asst. B. & B. Mast., C. N., Port Arthur, Ont., Can. (1959)
Collum, R. L., Mast. Carp., S. A. L., Jacksonville, Fla. (1941)
Conner, L. E., Supv. Wk. Equip., S. A. L., Hamlet, N. C. (1959)
Connor, J. J., Const. Engr., D. & H., Albany, N. Y. (1957)
Cook, E. F., W. S. Fore., M. P., Little Rock, Ark. (1947)
Cook, J. C., Jr., Asst. Gen. Fore. B. & B.-W. S., G. C. & S. F., Ft. Worth, Tex. (1959)
Cooledge, V. R., Engr. Br., S. P., San Francisco, Calif. (1953).
Cooper, S. A., Ch. Engr., G. M. & O., Mobile, Ala. (1959)
Corbett, R. K., Gen. Fore. B. & B.-W. S., A. T. & S. F., San Bernardino, Calif. (1956)
Cornett, B. J., B. & B. Supv., T. M., Alice, Tex. (1958)
Cothran, R. F., B. & B. Supv., Sou., Knoxville, Tenn. (1957)
Cox, R. C., B. & B. Supv., W. P., Sacramento, Calif. (1950)
Crane, J. C., Asst. B. & B. Supv., S. P., Portland, Ore. (1957)
Crawford, C. M., Engr.-Insp., U. P., Laramie, Wyo. (1958)
Creek, C. W., Asst. Supv. Struc., P. R. R., Chicago, Ill. (1957)
Creighton, J. H., B. & B. Mast., C. P., Toronto, Ont., Can. (1959)
Crespo, M. J., Gen. Supv. Br. & Struc., W. P., San Francisco, Calif. (1956)
Croft, P. H., Asst. Engr. M. of W., I. C., Memphis, Tenn. (1947)
Crounse, W. E., Const. Insp., D. & H., Albany, N. Y. (1945)
Cruikshank, A. W., P. & H. Supv., D. & H., Watervliet, N. Y. (1950)
Cummings, E. M., Div. Engr., B. & O., Connellsville, Pa. (1954)
Curie, H. D., Mast. Carp., B. & O., Garrett, Ind. (1942)
Currier, L. F., Asst. Br. Engr., L. & N., Louisville, Ky. (1958)

D

Dahlberg, A. R., B. & B. Supv., W. M., Hagerstown, Md. (1957)
Dal Cerro, N. J., Elec. Fore., P. R. R., Chicago, Ill. (1957)
Dalziel, H. M., Ch. Engr., South Buff., Bethlehem, Pa. (1959)
David, J. J., Asst. Supv. Auto. & Wk. Equip., T. & N. O., Houston, Tex. (1953)
Davidson, J. W., Engr. Br., C. B. & Q., Chicago, Ill. (1957)
Davis, H. E., Supv. B. & B., N. Y. C., Mattoon, Ill. (1940)

Davis, L. H., (Ret.), Gen. Fore. B. & B., A. T. & S. F., Amarillo, Tex. (1948)
Day, F. D., Area Engr. Struc., P. R. R., Pittsburgh, Pa. (1949)
Deal, C. D., Supv. Maint. Equip. & Weld., N. Y. C., New York, N. Y. (1959)
Defendorf, C. E., Ch. Engr., N. Y. C., New York, N. Y. (1956)
DeMate, M. A., (Ret.), Struc. Engr., St. L.-S. F., Springfield, Mo. (1955)
Deno, L. J., Div. Engr., C. & N. W., Green Bay, Wis. (1947)
Derryberry, J. T., Supv. B. & B., W. M., Cumberland, Md. (1955)
DeValle, J. W., Engr. Br.-Sys., Sou., Washington, D. C. (1959)
Dick, M. H., Vice Pres. & Ed., Ry. Trk. & Struc., Chicago, Ill. (1937)
Dickison, C. S., Supv. B. & B., C. & O., Russell, Ky. (1953)
Diehl, C. M., Asst. Engr., W. M., Cumberland, Md. (1959)
Dimick, C. A., Supv. B. & B., N. Y. C., Boston, Mass. (1957)
Dixon, C. E., Asst. Supv. B. & B., M. C., Portland, Me. (1955)
Dixon, N., B. & B. Mast., C. N., Montreal, Que., Can. (1949)
Doggett, T. S., Supv. B. & B. & Maint. Force, R. F. & P., Richmond, Va. (1959)
Dove, R. E., Assoc. Ed., Ry. Trk. & Struc., Chicago, Ill. (1934)
Duffy, P. E., Supv. B. & B., G. N., Minneapolis, Minn. (1957)
Dunlop, A. R., Jr., Supv. Struc., P. R. R., Cleveland, Ohio (1959)
Dunn, W. M. S., Staff Asst. to Ch. Engr., C. & O., Huntington, W. Va. (1957)
Duresky, F., Jr., Supv. B. & B., C. & N. W., Huron, S. D. (1942)
Durston, S. G., Mast. Carp., Erie, Salamanca, N. Y. (1959)
Dysart, C. E., Asst. Supv. B. & B., F. E. C., St. Augustine, Fla. (1959)
Dysinger, M. A., Asst. Engr., Sou., Washington, D. C. (1956)

E

Eargle, J. M., Mast. Carp., S. A. L., Atlanta, Ga. (1953)
Eble, A. E., Tr. Mast., St. L. S. W., Texarkana, Tex. (1953)
Eichenlaub, C. M., Supt., S. D. & A. E., San Diego, Calif. (1943)
Elledge, L. M., Asst. Gen. Mgr., M. P., Little Rock, Ark. (1959)
Ellerbrock, D. T., Mast. Carp., B. & O., Indianapolis, Ind. (1956)
Elliott, C. E., Engr. Trk., W. P., San Francisco, Calif. (1950)
Ellis, J. S., Supv. B. & B., C. & O., Grand Rapids, Mich. (1957)
Elower, L., Trav. Br. Insp., Erie, Oswego, N. Y. (1948)
Enderle, R. E., Div. Engr., B. & O., Garrett, Ind. (1955)
Enger, E. M., Supv. B. & B., C. & N. W., St. Paul, Minn. (1947)
Engle, T. J., Engr. Bldg., C. R. I. & P., Chicago, Ill. (1959)
Erickson, O., B. & B. Fore., S. P., Sacramento, Calif. (1950)
Erskine, J. A., Asst. B. & B. Engr., G. M. & O., Mobile, Ala. (1959)
Etchison, F. L., Ch. Engr., W. M., Baltimore, Md. (1959)

F

Fairchild, E. H., Asst. Engr., U. P., North Platte, Nebr. (1958)
Ferry, M. H., (Ret.), Mast. Carp., Erie, Hornell, N. Y. (1952)
Fetters, R. B., Div. Engr., C. R. I. & P., El Reno, Okla. (1958)
Firehammer, L. M., Supv. B. & B., Ill. Term., Springfield, Ill. (1919)
Fisher, D. H., Supv. Br. Maint., C. M. St. P. & P., Chicago, Ill. (1952)
Flayhart, W. H., Gen. Fore. B. & B., P. R. R., Williamsport, Pa. (1959)
Fobes, E. E., (Ret.), Supv. B. & B., N. Y. C., Syracuse, N. Y. (1957)
Fondren, R. W., B. & B. Supv., Sou., Greenville, S. C. (1958)
Foreman, J. E., Jr., Engr. Struc.-Oper., B. & L. E., Greenville, Pa. (1957)
Forman, H. C., Asst. Vice Pres., L. & N., Birmingham, Ala. (1958)
Forseth, C. E., Div. Engr., W. P., Sacramento, Calif. (1950)
Fort, O. E., Asst. Ch. Engr., St. L.-S. F., Springfield, Mo. (1957)
Foster, C. B., B. & B. Supv., Sou., Greensboro, N. C. (1954)
Fox, J., Supv. M. of W., C. P., Montreal, Que., Can. (1955)
Fox, R. L., Proc. Engr.-Struc., Sou., Washington, D. C. (1935)
Franzen, E. T., Engr. Br., C. R. I. & P., Chicago, Ill. (1957)
Frederick, A. H., Ch. Oper. Detector Cars, C. M. St. P. & P., Chicago, Ill. (1959)
Frederickson, N. H., Supv. W. S., I. C., Memphis, Tenn. (1956)
Freseman, C. J., Div. Engr., C. & N. W., St. Paul, Minn. (1957)
Friets, C. G., Supv. B. & B., C. & N. W., Escanaba, Mich. (1957)
Fritzinger, G. F., Asst. Engr., Wabash, St. Louis, Mo. (1957)
Fronabarger, H. C., (Ret.), B. & B. Supv., T. & P., Ft. Worth, Tex. (1949)
Frost, L. M., Supv. B. & B., G. T. W., Battle Creek, Mich. (1938)
Fuller, T. L., Supv. Struc., T. & N. O., Houston, Tex. (1959)
Fussell, W., Asst. Supv. B. & B., L. & N., Pensacola, Fla. (1959)

G

Gabrio, C. W., Engr. Struc., Virginian, Norfolk, Va. (1947)
Gamble, H. H., Asst. Trk. Supv., B. & M., North Adams, Mass. (1957)
Gannon, J. P., Div. Engr., M. St. P. & S. S. M., Stevens Point, Wis. (1947)
Garcelon, C. E., Asst. to Mgr. Oper., B. & A., Bangor, Me. (1945)
Garland, E. F., Br. Supv., N. O. P. B., New Orleans, La. (1953)
Gates, C. A., Br. Engr.-East. Lines, A. T. & S. F., Topeka, Kans. (1959)
Gehrke, E. G., Asst. Secy., A. R. E. A. & Secy., Engr. Div., A. A. R., Chicago, Ill. (1959)
George, S. W., Div. Engr., W. M., Cumberland, Md. (1956)
Gillespie, W. G., Mast. Carp., B. & O., Grafton, W. Va. (1946)
Gilmore, J. M., Meth. Engr. B. & B., N. Y. C., New York, N. Y. (1959)
Gilmore, R. W., Gen. Br. Insp., B. & O., Cincinnati, Ohio (1943)
Gipson, C. G., Gen. Fore. B. & B. - W. S., A. T. & S. F., Winslow, Ariz. (1956)
Gladwin, F. E., B. & B. Supv., N. W. P., San Rafael, Calif. (1950)
Goforth, J. A., Maint. Engr., Clinchfield, Erwin, Tenn. (1954)
Gogl, E. U., B. & B. Supv., S. P., Portland, Ore. (1955)
Gottsabend, W. J., Asst. Supv. Struc., P. R. R., Columbus, Ohio (1957)
Graham, W. R., Supv. B. & B., C. & O., Covington, Ky. (1946)
Grant, A. F., Asst. B. & B. Supv., N. P., Missoula, Mont. (1959)
Green, C. C., Mast. Carp., B. & O., Wheeling, W. Va. (1953)
Grieder, R. E., Asst. to Br. Engr., G. N., St. Paul, Minn. (1958)
Groner, B. H., Drain. Engr., I. C., Chicago, Ill. (1957)
Gueller, H. L., Asst. Gen. Br. Insp., C. & N. W., Green Valley, Wis. (1959)
Gunderson, R. R., Engr. M. of W., W. M., Baltimore, Md. (1947)

H

Haase, E. H., B. & B. Supv., S. P., Oakland, Pier #7, Calif. (1954)
Hagenmaier, C. E., Asst. B. & B. Supv., S. P., Los Angeles, Calif. (1950)
Haines, P., B. & B. Supv., C. & O., Saginaw, Mich. (1943)
Hall, J. H., Asst. Div. Engr., Sou., Macon, Ga. (1955)
Halliday, H. C., B. & B. Mast., C. N., Edmonton, Alta., Can. (1959)
Hamilton, A. R. G., B. & B. Mast., C. N., Hornepayne, Ont., Can. (1957)
Hamilton, C. W., Engr. Design, Wabash, St. Louis, Mo. (1950)
Hamilton, W. A., Jr., Br. Engr., G. C. & S. F., Galveston, Tex. (1955)
Hampton, A. A., B. & B. Supv., M. P., De Quincy, La. (1947)
Hansen, A. E., Ch. Carp., C. M. St. P. & P., Savanna, Ill. (1954)
Harding, W. G., Arch., Wabash, St. Louis, Mo. (1957)
Harlow, H. M., Asst. Gen. Supv. B. & B., C. & O., Richmond, Va. (1939)
Harman, C. A., Gen. Fore. B. & B., P. R. R., Baltimore, Md. (1958)
Harper, W. B., Supv. Trk., I. C., Vicksburg, Miss. (1953)
Harris, A. R., Engr. Br., C. & N. W., Chicago, Ill. (1940)
Harrison, G. C., Ch. Engr., L. A. Jct., Los Angeles, Calif. (1959)
Harwood, M. S., (Ret.), Asst. B. & B. Supv., S. P., San Mateo, Calif. (1948)
Hawley, I. H., Asst. Engr., C. & I. M., Springfield, Ill. (1957)
Hayes, J. W., Arch., G. N., St. Paul, Minn. (1957)
Heck, J. E., Supv. B. & B., C. & O., Ashland, Ky. (1958)
Hecker, R. L., Supv. B. & B., C. & O., Plymouth, Mich. (1947)
Hedley, W. J., Ch. Engr., Wabash, St. Louis, Mo. (1950)
Hefte, A., Sr. Asst. B. & B. Supv., N. W. P., San Rafael, Calif. (1952)
Heinlen, R. H., Div. Engr., G. C. & S. F., Ft. Worth, Tex. (1957)
Hellickson, D. E., Asst. Supv. B. & B., G. N., Whitefish, Mont. (1954)
Hellweg, R. D., Asst. Reg. Engr., G. M. & O., Bloomington, Ill. (1947)
Helmle, C. E., Asst. to Ch. Engr., T. & N. O., Houston, Tex. (1959)
Hemmer, A. F., Mast. Carp., C. B. & Q., Omaha, Nebr. (1959)
Hemmeter, L. F., Proj. Engr., B. & O., Baltimore, Md. (1959)
Hendrix, W. P., Engr. B. & B., P. R. R., Philadelphia, Pa. (1954)
Herbort, W. F., Asst. Supv. Struc., P. R. R., Ft. Wayne, Ind. (1957)
Hickok, B. M., Supv. B. & B., N. Y. C., Cleveland, Ohio (1951)
Higgins, L. H., Gen. Fore. B. & B.-W. S., A. T. & S. F., Clovis, N. M. (1958)
Hillman, W. C., Supv. B. & B., Clinchfield, Erwin, Tenn. (1953)
Hiner, J. T., Ch. Engr. M. of W. & Struc., Sou., Cincinnati, Ohio (1950)
Hinkel, E. H., Mast. Carp., Reading, St. Clair, Pa. (1957)
Hinsch, L. C., Asst. Engr., C. M. St. P. & P., Savanna, Ill. (1957)
Hobbs, J. C., Asst. Supv. B. & B., Clinchfield, Erwin, Tenn. (1958)
Hodgkins, E. W., Jr., Assoc. Ed., Ry. Trk. & Struc., Chicago, Ill. (1958)
Hodgson, A. W., Ch. Carp., C. M. St. P. & P., Deer Lodge, Mont. (1955)

Hoffman, E. L., Div. Engr., C. & N. W., Norfolk, Nebr. (1957)
Hoffmann, J. P., Bldg. Insp., I. C., Waterloo, Iowa (1959)
Hogel, E. C., B. & B. Supv., U. P., North Platte, Nebr. (1958)
Holmes, E. J., Mast. Carp., Erie, Huntington, Ind. (1952)
Holt, C. V., Jr. Engr.-Grade B, St. L.-S. F., Ft. Smith, Ark. (1959)
Hopkins, J. M., Engr. Design, E. J. & E., Joliet, Ill. (1958)
Hopton, J. P., Engr. Maint., C. U. T., Cincinnati, Ohio (1955)
Hornig, F. F., Div. Engr., C. M. St. P. & P., Austin, Minn. (1947)
Hosp, W. B., Paint Supv., N. & W., Roanoke, Va. (1959)
Hostetter, R. A., Gen. Supt. M. of W. Equip. & Scl., T. & N. O., Houston, Tex. (1959)
Hotard, A. E., Asst. Br. Engr., L. & N., Louisville, Ky. (1953)
Howard, J. G., Asst. B. & B. Supv.-Insp., W. P., Sacramento, Calif. (1953)
Howard, P. D., R. R. Supv., Minn. Mining & Mfg., St. Paul, Minn. (1957)
Howard, W. A., Asst. B. & B. Supv., T. & N. O., Ennis, Tex. (1957)
Howe, W. C., Engr. B. & B., B. & L. E., Greenville, Pa. (1959)
Hoyt, A. C., Engr. B. & B., E. J. & E., Joliet, Ill. (1947)
Hoza, W. S., Mast. Carp., Erie, Hornell, N. Y. (1959)
Hubbard, M. J., Asst. Ch. Engr.-Sys., C. & O., Huntington, W. Va. (1948)
Huckabay, J. B., Asst. Engr., A. T. & S. F., Amarillo, Tex. (1958)
Huckaby, V. T., Asst. Div. Engr., M. K. T., Parsons, Kans. (1947)
Huffman, W. H., Asst. Ch. Engr.-Const., C. & N. W., Chicago, Ill. (1941)
Hull, F. G., Supv. B. & B., C. & O., Blenheim, Ont., Can. (1957)
Humphreys, R. W., Spec. Asst. to Gen. Mgr., N. P., Seattle, Wash. (1947)
Hunt, H. A., Asst. to Ch. Engr., T. & N. O., Houston, Tex. (1959)
Huntsman, W. J., Supv. Struc., D. & R. G. W., Grand Junction, Colo. (1957)
Hurley, G. L., Gen. B. & B. Supv., Q. N. S. & L., Sept Isles, Que., Can. (1959)
Hutcheson, F. W., Supv. B. & B., C. & O., Newport News, Va. (1938)
Hutcheson, W. A., Supv. Wk. Equip., C. & O., Clifton Forge, Va. (1939)
Hutchings, V. W., B. & B. Supv., S. P., Bakersfield, Calif. (1941)
Hutchinson, D. G., Asst. B. & B. Supv.-Insp., W. P., Elko, Nev. (1950)
Hutson, H. O., Asst. Engr., B. & O., Baltimore, Md. (1959)
Hutto, J. E., Res. Engr., S. A. L., Savannah, Ga. (1951)
Hyma, W. R., Asst. Engr., A. T. & S. F., Chicago, Ill. (1958)
Hynes, E. J., Asst. B. & B. Engr., D. T. & I., Dearborn, Mich. (1958)

I

Inabinet, J. V., Gen. Br. Insp., S. A. L., Jacksonville, Fla. (1948)
Ingram, J. L., Struc. Drafts., T. R. R. A. of St. L., St. Louis, Mo. (1954)

J

Jackman, C. E., Asst. Ch. Engr.-Maint., B. & O., Baltimore, Md. (1958)
Jackson, H. O., B. & B. Supv., G. N., Grand Forks, N. D. (1958)
Jackson, S. M., Spec. Asst. Oil & Gas Dev., M. P., St. Louis, Mo. (1951)
Jackson, T. E., Gen. B. & B. Supv., S. P., San Francisco, Calif. (1940)
Jarratt, M., Wtr. & Fuel Supv., S. P., Tucson, Ariz. (1950)
Jarrell, M., Asst. Engr. Br., B. & O., Baltimore, Md. (1959)
Jawor, J. J., Br. Insp., P. R. R., Chicago, Ill. (1959)
Jenkins, H. W., Ch. Engr., N. Y. N. H. & H., New Haven, Conn. (1940)
Jenkins, R. W., Struc. Engr., St. L.-S. F., Springfield, Mo. (1955)
Jentoft, L. H., Asst. Ch. Engr. M. of W., Erie, Cleveland, Ohio (1959)
Jess, G., Asst. Mast. Carp., Erie, Youngstown, Ohio (1959)
Johns, D. H., Supv. Struc., P. R. R., Buffalo, N. Y. (1958)
Johnson, A. C., Ch. Engr., E. J. & E., Joliet, Ill. (1944)
Johnson, B. L., B. & B. Mast., C. N., Winnipeg, Man., Can. (1957)
Johnson, B. O., Off. Engr., C. M. St. P. & P., Chicago, Ill. (1931)
Johnson, D. H., Supv. B. & B.. C. St. P. M. & O., Eau Claire, Wis. (1940)
Johnson, E. A., Engr. Br., I. C., Chicago, Ill. (1953)
Johnson, G. C., B. & B. Supv., C. & N. W., Green Bay, Wis. (1955)
Johnson, H. I., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1957)
Johnston, G. H., Bldg. Supt., A. T. & S. F., Topeka, Kans. (1950)
Jones, A. C., Jr., Prin. Asst. Div. Engr., S. A. L., Savannah, Ga. (1959)
Jones, E. B., Gen. Fore. Maint. & Const., C. & O., Huntington, W. Va. (1945)
Jorlett, J. A., Area Engr. Struc., P. R. R., Philadelphia, Pa. (1946)

K

Kahl, F. B., Asst. Supt. Maint. & Engr., G. N., Klamath Falls, Ore. (1959)
Kelly, G. E., Wtr. & Fuel Supv., S. P., Bakersfield, Calif. (1953)

Kelly, J. R., B. & B. Supv., Sou., Somerset, Ky. (1952)
Kendall, J. T., Asst. Supv. Struc., P. R. R., Cleveland, Ohio (1949)
Kenyon, J. R., Gen. B. & B. Supv., N. Y., N. H. & H., New Haven, Conn. (1955)
Kieckers, E. W., Asst. Br. Engr., M. P., St. Louis, Mo. (1958)
Kilby, J. T., B. & B. Mast., C. N., Edmundston, N. D., Can. (1959)
Klein, C. A., Br. Maint. Engr., Reading, Philadelphia, Pa. (1958)
Klouda, R. G., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1956)
Koehler, P. L., Div. Supt., C. & O., Covington, Ky. (1938)
Koenig, M. E., Div. Engr., C. St. P. M. & O., St. Paul, Minn. (1957)
Koster, K., Drafts., C. M. St. P. & P., Chicago, Ill. (1959)
Krefting, A. S., Asst. Ch. Engr.-Br. & Struc., M. St. P. & S. S. M., Minneapolis, Minn. (1935)
Kruse, H. H., Ch. Carp., C. M. St. P. & P., Minneapolis, Minn. (1957)
Kvenberg, S. E., Supv. Bldg. Maint., C. M. St. P. & P., Chicago, Ill. (1932)

L

Lackey, J. B., B. & B. Supv., L. & N., Louisville, Ky. (1958)
Lane, J. R., Asst. Engr. Maint. (Br.), Sou., Atlanta, Ga. (1957)
Langan, G., Asst. Supv. Struc., P. R. R., Indianapolis, Ind. (1957)
Langlois, J. E. R., Asst. B. & B. Mast., C. N., Parent, Que., Can. (1957)
*Langston, J. H., Stud. Appren. Engr., St. L.-S. F., Amory, Miss. (1959)
Larson, K., Supv. B. & B., C. & N. W., Boone, Iowa (1957)
Larson, L. M., Asst. B. & B. Supv., G. N., Superior, Wis. (1957)
Latimer, J. A., Gen. Fore. B. & B.-W. S., St. L.-S. F., Ft. Worth, Tex. (1957)
Laurick, M. J., Asst. Supv. Struc., P. R. R., Ft. Wayne, Ind. (1952)
Lawrence, E. J., Br. Insp., N. Y. C., Springfield, Mass. (1957)
Layman, D. C., Gen. Fore. B. & B., I. C., Jackson, Tenn. (1952)
Lea, E. T., Ch. Engr. M. of W. & Struc., C. & G., Columbus, Miss. (1959)
Leach, A. L., Asst. Engr. Br., I. C., Chicago, Ill. (1955)
Leak, V. L., (Ret.), Gen. Fore. B. & B.-W. S., St. L.-S. F., Tulsa, Okla. (1948)
LeDonne, J. A., Engr. Trk., Monon. Conn., Pittsburgh, Pa. (1958)
Lehman, H. G., B. & B. Supv., S. P., Tucson, Ariz. (1950)
Leinweber, F. J., B. & B. Mast., C. N., St. Thomas, Ont., Can. (1947)
Lichtenberger, F. W., Mast. Carp., Erie, Marion, Ohio (1959)
Lieser, H. J., Supv. B. & B., C. & W. I., Chicago, Ill. (1948)
Lingle, T. N., Supv., B. & B., I. C., Carbondale, Ill. (1951)
Linn, G. A., Div. Engr., C. & N. W., Chadron, Nebr. (1940)
Little, H. C., Supv. W. S., I. C., New Orleans, La. (1948)
Loggins, L. A., Ch. Engr., T. & N. O., Houston, Tex. (1959)
Lokotzke, G. P., Supv. B. & B., E. J. & E., Gary, Ind. (1947)
Lowry, J. M., Ch. Engr., St. L. S. W., Tyler, Tex. (1950)
Lucas, H. F., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1952)
Luce, W. L., Mast. Carp., Erie, Youngstown, Ohio (1952)
Lund, C. V., Asst. to Ch. Engr., C. M. St. P. & P., Chicago, Ill. (1947)
Lundgren, H. M., Asst. B. & B. Mast., C. N., Kamloops, B. C., Can. (1957)
Lynch, J. F., Jr., Sr. Asst. B. & B. Supv., S. P., Tucson, Ariz. (1959)
Lyon, L. E., Div. Engr., S. P., Tucson, Ariz. (1947)

Mc

McCall, H. W., Ch. Carp., C. M. St. P. & P., LaCrosse, Wis. (1955)
McCauley, M. L., Asst. Engr. Struc., N. Y. C., New York, N. Y. (1950)
McCormick, K. L., B. & B. Supv., Pac. Elec., Los Angeles, Calif. (1958)
McCosky, L. E., Asst. B. & B. Supv., C. & N. W., Green Bay, Wis. (1958)
McDermott, A. A., B. & B. Supv., S. P., Dunsmuir, Calif. (1945)
McDiarmid, R. J., Supv. B. & B., E. J. & E., Joliet, Ill. (1957)
McDonald, J. W., Gen. Fore. B. & B.-W. S., St. L. - S. F., Springfield, Mo. (1947)
McElreath, C. S., B. & B. Supv., Sou., Atlanta, Ga. (1951)
McGee, M. A., Div. Engr., L. & N., Ravenna, Ky. (1954)
McGrew, B. H., Supv. B. & B., St. L. S. W., Tyler, Tex. (1951)
McGrew, F. O., Ch. Carp., C. M. St. P. & P., Madison, Wis. (1948)
McHaffie, J. N., Asst. Supv. B. & B., G. N., Minneapolis, Minn. (1958)
McIver, J., B. & B. Supv., N. S., Edenton, N. C. (1956)
McKenney, C. E., Sys. Scl. Insp., N. Y. C. & St. L., Ft. Wayne, Ind. (1956)
McKibben, D. H., Supv. Struc., P. R. R., Harrisburg, Pa. (1951)
McMann, J. B., Gen. B. & B. Fore., U. P., Omaha, Nebr. (1958)
McMillan, R. J., B. & B. Mast., C. N., Kamloops, B. C., Can. (1957)
McMillen, J. W., Off. Engr., T. R. R. A. of St. L., St. Louis, Mo. (1954)
McPherson, J. W., Div. Engr., Sou., Greenville, S. C. (1957)

M

MacDonald, J. J., Supv. B. & B., B. & M., Boston, Mass. (1959)
Mack, H. L., Asst. Engr., M. P., DeQuincy, La. (1959)
MacQuarrie, A. C., B. & B. Mast., C. N., New Glasgow, N. S., Can. (1957)
Madvig, H. J., Asst. Engr., C. M. St. P. & P., Minneapolis, Minn. (1959)
Malmberg, C. R., Supv. B. & B., C. & N. W., Norfolk, Nebr. (1957)
Malone, J. W., Asst. Engr., Wabash, St. Louis, Mo. (1957)
Malone, W. J., Off. Engr., G. T. W., Detroit, Mich. (1959)
Manson, A., Div. Engr., L. & N., Birmingham, Ala. (1957)
Martin, J. D., Ch. Carp., C. M. St. P. & P., Canton, S. D. (1955)
Martin, J. W., Mast. Carp., S. A. L., Tampa, Fla. (1953)
Martin, W. H., Asst. Engr., G. M. & O., Mobile, Ala. (1959)
Martyn, G. W., Off. Engr., E. J. & E., Joliet, Ill. (1959)
Mason, E. L., B. & B. Supv., M. P., Kingsville, Tex. (1946)
Mason, S. K., Ch. Engr., T. M., Laredo, Tex. (1950)
Mathias, H. O., Asst. Engr., P. R. R., Chicago, Ill. (1959)
Matthews, H. A., Gen. Fore. B. & B.-W. S., St. L. - S. F., Amory, Miss. (1949)
Matthews, W. L., Sr. Asst. B. & B. Supv., S. P., Tucson, Ariz. (1953)
Mayfield, L., Prin. Asst. Engr., M. P., St. Louis, Mo. (1944)
Mays, J. W. N., Asst. Engr.-Sys., P. R. R., Philadelphia, Pa. (1947)
Meeker, G. W., Gen. B. & B. Fore., N. Y. N. H. & H., Hartford, Conn. (1959)
Meeks, W. R., B. & B. Supv., M. P., Falls City, Nebr. (1942)
Meeth, P. W., B. & B. Insp., St. L.-S. F., Lebanon, Mo. (1957)
Melton, H. W., B. & B. Supv., G. N., Seattle, Wash. (1957)
Meredith, W. E., Supv. Struc., P. R. R., Canton, Ohio (1950)
Merrill, B. W., Supv. B. & B., N. Y. C. & St. L., Conneaut, Ohio (1936)
Meserve, E. S., Asst. Supv. B. & B., B. & M., Dover, N. H. (1949)
Messman, D. V., Engr. Br., Sou., Knoxville, Tenn. (1955)
Mettlach, P. A., B. & B. Fore., G. B. & W., Arcadia, Wis. (1956)
Meyers, B. R., Vice Pres. & Ch. Engr., C. & N. W., Chicago, Ill. (1930)
Midkiff, R. B., Ch. Engr. M. of W. & Struc., Sou., Knoxville, Tenn. (1953)
Miller, R. H., Maint. Engr., L. S. & I., Marquette, Mich. (1953)
Milne, A. P., Supv. B. & B., N. Y. C. & St. L., Frankfort, Ind. (1953)
Mitchell, D. N., Asst. Supv. B. & B., C. & O., Newport News, Va. (1948)
Molinari, V. N., Asst. Off. Engr., D. & H., Albany, N. Y. (1957)
Moline, R. F., Br. Engr., D. T. & I., Dearborn, Mich. (1956)
Montague, C. F., Supt. M. W. Equip., P. R. R., Philadelphia, Pa. (1953)
Moore, G. A., Asst. Mast. Carp., S. A. L., Savannah, Ga. (1959)
Moore, H. R., Ch. Engr. M. of W. & Struc., Sou., Charlotte, N. C. (1956)
Moore, I. A., Ch. Engr., C. & E. I., Danville, Ill. (1937)
Moore, J. D., Supv. Struc., P. R. R., Harrington, Del. (1953)
Moreland, H. B., Supv. B. & B., Sou., Hattiesburg, Miss. (1951)
Morgan, C. E., Asst. B. & B. Supv., T. & N. O., San Antonio, Tex. (1954)
Morgan, L. R., Asst. Res. Engr. Struc., A. A. R., Chicago, Ill. (1937)
Moris, R. F., B. & B. Supv., N. Y., C. & St. L., Ft. Wayne, Ind. (1955)
Morris, C. L., Supv. B. & B., L. & N., Mobile, Ala. (1957)
Morris, C. R., Asst. B. & B. Supv., N. P., Tacoma, Wash. (1957)
Morrison, R. H., Vice Pres. & Ch. Engr., L. S. & I., Marquette, Mich. (1941)
Moser, C. A., B. & B. Supv., S. N. - T. S., Sacramento, Calif. (1951)
Moser, C. L., B. & B. Supv., Sou., Asheville, N. C. (1955)
Mouhot, P. T., (Ret.), B. & B. Supv., T. & N. O., Lafayette, La. (1952)
Moutoux, H. G., Sr., Supv. B. & B., N. Y. C., Syracuse, N. Y. (1959)
Murray, D. J., Engr. Drafts., C. & W. I.-Belt Ry. of Chi., Chicago, Ill. (1954)
Myers, E. T., Assoc. Ed., Modern R. Rs., Chicago, Ill. (1957)
Myers, R. L., Wtr. Chemist, I. C., Mattoon, Ill. (1950)

N

Neal, C. E., Div. Engr., N. W. P., San Rafael, Calif. (1959)
Neal, G. W., Supt., Chattahoochee Valley, West Point, Ga. (1948)
Nelson, M. S., Asst. Supv. B. & B., N. Y. C., Charleston, W. Va. (1956)
Nelson, R. D., Div. Engr., C. & N. W., Huron, S. D. (1957)
Neutts, F. T., Asst. Engr., D. & H., Albany, N. Y. (1957)
Newlin, C. H., Engr. Br., Sou., Charlotte, N. C. (1959)
Nicely, O. P., Supv. B. & B., C. & O., Clifton Forge, Va. (1950)
Nichols, J. C., Br. Engr., L. & N., Louisville, Ky. (1954)
Nichols, R. E., Gen. Fore. B. & B.-W. S., St. L.-S. F., Chaffee, Mo. (1957)

Nordstrom, R. D., Asst. Engr. Br. & Struc., W. P., San Francisco, Calif. (1959)
Norris, J. M. W., B. & B. Supv., D. & H., Oneonta, N. Y. (1957)

O

O'Brien, J. B., Asst. Supv. B. & B., C. & O., Richmond, Va. (1954)
Odgers, F. T., Asst. B. & B. Supv., S. P., Portland, Ore. (1955)
Oest, W. C., Prin. Asst. Engr., F. W. & D., Ft. Worth, Tex. (1947)
Ogle, H., Br. Insp., C. & E. I., Salem, Ill. (1956)
O'Keefe, F. J., Asst. Supv. Struc., P. R. R., Buffalo, N. Y. (1957)
Olson, O. D., B. & B., Supv., C. & N. W., Chicago, Ill. (1953)
Olson, V. E., B. & B. Supv., M. St. P. & S. S. M., Stevens Point, Wis. (1948)
Ornburn, B. J., Asst. Ch. Engr. Struc., C. M. St. P. & P., Chicago, Ill. (1948)
Ostrom, W. D., Ch. Carp., C. M. St. P. & P., Chicago, Ill. (1954)
Ovardits, K., Asst. Engr. Grade Cross., N. Y. C., Chicago, Ill. (1953)
Owens, B. H., Gen. Fore. B. & B., I. C., Vicksburg, Miss. (1956)

P

Packard, B. G., Off. Engr., C. & N. W., Chicago, Ill. (1954)
Pahl, W. H., Jr., Supv. Struc., P. R. R., Balitmore, Md. (1950)
Palagi, L. A., Asst. Engr. Bldg., C. R. I. & P., Chicago, Ill. (1959)
Panushka, E. A., B. & B. Supv., N. P., Fargo, N. D. (1959)
Parrish, E. L., Div. Engr., I. C., Vicksburg, Miss. (1947)
Parvin, C. F., Engr. M. of W. & Struc., P. R. R., Philadelphia, Pa. (1959)
Patterson, C. A., B. & B. Supv., T. P. & W., Washington, Ill. (1955)
Patterson, C. C., Mast. Carp., C. B. & Q., Alliance, Nebr. (1958)
Patterson, J. A., Supv. B. & B., N. Y. C., Weehawken, N. J. (1957)
Patterson, R. H., Asst. Ch. Engr., St. L. S. W., Tyler, Tex. (1955)
Payne, G. C., Gen. Fore. B. & B.-W. S., St. L.-S. F., Tulsa, Okla. (1959)
Pearce, J. R., Supv. B. & B., L. & N., Latonia, Ky. (1957)
Pearson, A. H., Mast. Carp., C. B. & Q., St. Joseph, Mo. (1952)
Pederson, W. E., B. & B. Supv., M. St. P. & S. S. M., Superior, Wis. (1950)
Peffly, J. E., (Ret.), Asst. B. & B. Supv., Pac. Elec., Los Angeles, Calif. (1958)
Perrier, J. L., Div. Engr., C. & N. W., Chicago, Ill. (1953)
Peterson, H. R., Ch. Engr., N. P., St. Paul, Minn. (1953)
Peterson, J. C., Sr. Asst. B. & B. Supv., S. P., Sacramento, Calif. (1950)
Peterson, J. M., Br. Engr., C. G. W., Oelwein, Iowa (1959)
Peterson, N. E., Ch. Engr., C. & I. M., Springfield, Ill. (1938)
Petteys, W. F., Engr. M. of W., Erie, Jersey City, N. J. (1948)
Pfeiffer, A. B., Asst. B. & B. Supv., S. P., Stockton, Calif. (1939)
Phelps, C. E., B. & B. Supv., A. & W. P. - W. Ry. of A., - Ga., Decatur, Ga. (1949)
Phillips, J. H., Engr. Struc., D. & H., Albany, N. Y. (1958)
Phillips, L., B. & B. Insp., W. M., Cumberland, Md. (1957)
Piper, J. F., Asst. Ch. Engr.-Const., P. R. R., Philadelphia, Pa. (1959)
Potts, G. W., Asst. Supv. B. & B., L. & N., Knoxville, Tenn. (1957)
Potts, H. F., Supv. Struc., P. R. R., Ft. Wayne, Ind. (1957)
Pound, E. R., Mast. Carp., B. & O., Newark, Ohio (1952)
Prentiss, E. W., Engr. B. & B., P. R. R., Philadelphia, Pa. (1959)
Price, A. C., B. & B. Mast., C. P., London, Ont., Can. (1953)
Pritchard, B. L., Gen. Fore. B. & B.-W. S., P. & S. F., Amarillo, Tex. (1956)
Prober, H. W., Sr. Asst. B. & B. Supv., S. P., Los Angeles, Calif. (1957)
Prude, G. F., Asst. Supv. B. & B., T. & N. O., Houston, Tex. (1951)
Pruett, J. A., Supt. Fire Prev. & Fuel Supply, T. & N. O., Houston, Tex. (1959)

R

Raessler, V. D., Supv. B. & B., I. C., Memphis, Tenn. (1951)
Rainey, W. H., B. & B. Supv., T. & N. O., San Antonio, Tex. (1956)
Rainwater, C. W., B. & B. Supv., Alaska, Anchorage, Alaska (1959)
Rapant, F., Asst. Supv. Struc., P. R. R., Newark, N. J. (1955)
Rapier, L. F., Supv. B. & B., G. M. & O., Bloomington, Ill. (1946)
Raver, H. E., Engr. Struc. Design, L. I., Jamaica, N. Y. (1952)
Reed, T. C., Asst. Br. Insp., L. & N., Louisville, Ky. (1954)
Reese, C. L., Br. Insp., G. M. & O., Philadelphia, Miss. (1958)
Reese, C. M., Gen. Fore. B. & B., G. C. & S. F., Temple, Tex. (1953)
Reid, R. H., Asst. Supv. B. & B., C. & O., Clifton Forge, Va. (1955)
Reynolds, M. L., Sr. Asst. B. & B. Supv., S. P., Bakersfield, Calif. (1958)
Rhodes, O. J., Asst. Engr., L. & A., Shreveport, La. (1958)
Rice, E. D., B. & B. Supv., C. & E. I., Danville, Ill. (1949)

Richardson, F. L., (Ret.), Asst. Gen. Fore. B. & B.-W. S., St. L.-S. F., Enid, Okla. (1957)
Ridgeway, J. J., Engr. Struc. Proc., B. & L. E., Greenville, Pa. (1957)
Riffle, L. R., Ch. Carp., C. M. St. P. & P., Perry, Iowa (1956)
Riggs, W. K., B. & B. Supv., C. & N. W., West Chicago, Ill. (1959)
Riley, C. R., Ch. Engr., B. & O., Baltimore, Md. (1959)
Roberts, J. T., Div. Engr., Sou., Sheffield, Ala. (1956)
Robinson, G. E., Asst. Ch. Engr., N. Y. C., New York, N. Y. (1948)
Robinson, N. R., B. & B. Fore., S. P., Sacramento, Calif. (1934)
Rode, L. A., Gen. Br. Insp., Erie, Newark, N. J. (1948)
Rose, J. A., B. & B. Mast., C. P., Montreal, Que., Can. (1958)
Ross, R. F., Asst. Supv. B. & B., B. & M., Boston, Mass. (1959)
Rothell, R. D., Gen. B. & B. Supv., Sou., Charlotte, N. C. (1957)
Rouse, D. I., Gen. Fore., P. R. R., Chicago, Ill. (1959)
Rowland, J. W., Asst. Engr. Const., L. I., Jamaica, N. Y. (1956)
Rudisill, D. E., Asst. Ch. Engr. Maint., P. R. R., Philadelphia, Pa. (1959)
Runde, E. E., Ch. Masonry Insp., I. C., Chicago, Ill. (1959)
Russell, C. E., Supv. W. S., I. C., Chicago, Ill. (1953)
Rust, R. B., Jr., Asst. Div. Engr., Sou., Bristol, Va. (1957)
Rymer, J. R., Div. Engr., B. & O., Chicago, Ill. (1957)

S

Saether, A. H., Design., C. M. St. P. & P., Chicago, Ill. (1959)
Safley, J. R., B. & B. Supv., S. P., San Francisco, Calif. (1945)
St. Pierre, M. P., Asst. B. & B. Mast., C. N., Edmundston, N. B., Can. (1959)
Salmon, J. M., Jr., Ch. Engr., Clinchfield, Erwin, Tenn. (1938)
Sampson, H. L., Gen. Fore. B. & B., A. T. & S. F., Pueblo, Colo. (1958)
Sandberg, C. H., Ch. Engr.-East. Lines, A. T. & S. F., Topeka, Kans. (1958)
Sanderson, J. G., Asst. W. S. Fore., St. L.-S. F., Amory, Miss. (1959)
Sarris, P. T., Div. Engr., Sou., Knoxville, Tenn. (1955)
Sathre, C. O., B. & B. Supv., C. & N. W., Madison, Wis. (1950)
Saunders, T. D., Ch. Engr., Ont. Nor., North Bay, Ont., Can. (1930)
Saurer, D. E., (Ret.), Asst. Supv. Struc., P. R. R., Logansport, Ind. (1951)
Savage, F. E., Asst. B. & B. Supv., N. P., Minneapolis, Minn. (1957)
Schlaf, E. R., Asst. Supt. W. S., I. C., Chicago, Ill. (1947)
Schoener, J. T., Asst. Engr. Struc., M. P., St. Louis, Mo. (1957)
Schweitzer, E., Div. Engr., U. P., Cheyenne, Wyo. (1959)
Scites, P. E., Asst. Supv. B. & B., C. & O., Hinton, W. Va. (1950)
Seely, W. L., Asst. Engr., D. & H., Albany, N. Y. (1957)
Seitz, H., Struc. Engr., B. & O., Baltimore, Md. (1959)
Seley, L. L., Mast. Carp., C. B. & Q., Hannibal, Mo. (1953)
Sellers, J. B., Asst. Div. Engr., L. & N., Louisville, Ky. (1957)
Seltzer, J. W., Asst. Engr., P. R. R., Cincinnati, Ohio (1958)
Sempsrott, D. A., Dist. Engr., P. R. R., Chicago, Ill. (1959)
Shamblin, R. E., Supv. B. & B., N. & W., Bluefield, W. Va. (1957)
Shanklin, J. F., Asst. Gen. Br. Insp., C. & N. W., Chicago, Ill. (1959)
Sharkey, J. J. (Ret.), Gen. Fore. B. & B., P. R. R., Short Hills, N. J. (1951)
Shaw, J. E., Rdm., T. & N. O., Houston, Tex. (1959)
Short, W. L., Asst. Engr., M. P., St. Louis, Mo. (1951)
Shultz, E. R., Engr. M. of W. & Struc., P. R. R., Philadelphia, Pa. (1959)
Siegfried, F. A., Fore. Carp., Reading, Reading, Pa. (1947)
Simmons, E. R., B. & B. Supv., St. L. S. W., Pine Bluff, Ark. (1955)
Simmons, R. G., Gen. Rdm., C. M. St. P. & P., Chicago, Ill. (1957)
Simonson, E. F., B. & B. Supv., S. I., Sandpoint, Ida. (1958)
Simpson, L. W., Mast. Carp., B. & O., Pittsburgh, Pa. (1959)
Sinclair, C. H., Asst. Supv. B. & B., C. & N. W., Milwaukee, Wis. (1954)
Skinner, H. E., Supv. Scl. & Wk. Equip., E. J. & E., Joliet, Ill. (1944)
Skogreen, J. A ., Mast Carp., C. B. & Q., Wymore, Nebr. (1957)
Sladecek, B. F., Supv. Rdwy. Mach., T. & N. O., Houston, Tex. (1959)
Slagle, G. P., Ch. Carp., C. M. St. P. & P., Milwaukee, Wis. (1948)
Smedley, V. N., B. & B. Supv., U. P., Portland, Ore. (1959)
Smith, A. E., Ch. Engr., C. G. W., Oelwein, Iowa (1958)
Smith, A. P., Asst. Engr., C. & E. I., Danville, Ill. (1956)
Smith, C. A., Supv. B. & B., C. R. & I. - I. H. B., Hammond, Ind. (1946)
Smith, E. L., Gen. B. & B. Supv., Sou., Chattanooga, Tenn. (1952)
Smith, G. A., Mast. Carp., B. & O., Punxsutawney, Pa. (1959)

Smith, G. H., Struc. Design., M. P., St. Louis, Mo. (1958)
Smith, H. E., Pres. & Gen. Mgr., G. H. & H., Galveston, Tex. (1941)
Smith, J., B. & B. Supv., S. P., Sacramento, Calif. (1943)
Smith, L. L., Sr. Asst. B. & B. Supv., S. P., Dunsmuir, Calif. (1948)
Smith, R. H., Jr., Dist. Engr., P. R. R., Columbus, Ohio (1957)
Snyder, E. F., Asst. to Ch. Engr., I. C., Chicago, Ill. (1948)
South, J. E., Sys. Engr. Struc., P. R. R., Philadelphia, Pa. (1959)
Sparks, F. P., Asst. B. & B. Supv., N. Y. C., Mt. Carmel, Ill. (1954)
Spinks, W. H., Ch. Clk., C. M. St. P. & P., Chicago, Ill. (1959)
Spofford, F. R., Asst. to Vice Pres.-Oper., B. & M., Boston, Mass. (1940)
Sprengel, H. A., B. & B. Supv., M. P., Osawatomie, Kans. (1950)
Stadter, C. O., B. & B. Supv., M. P., Monroe, La. (1955)
Stanczyk, W., Detailer, C. M. St. P. & P., Chicago, Ill. (1957)
Starnes, W. B., Br. Insp., M. P., Kingsville, Tex. (1959)
Steel, J. V., Engr., Acct., U. T. Co., Dallas, Tex. (1953)
Stephen, T. J., Head Drafts., U. P., Kansas City, Mo. (1958)
Stephens, B. M., Jr., Asst. to Exec. Vice Pres., T. & N. O., Houston, Tex. (1946)
Stillson, J., Gen. Fore.-Struc., P. R. R., Johnstown, Pa. (1959)
Stinebaugh, J. H., Supv. W. S. & Rdwy. Mach., I. C., Carbondale, Ill. (1951)
Sturman, J. J., Dist. Br. Insp., B. & O., Baltimore, Md. (1959)
Stutes, S. A., Asst. Supv. Struc., T. & N. O., Houston, Tex. (1959)
Sullivan, P., Engr. Insp., W. P., Oroville, Calif. (1957)
Sweet, W. A., Gen. Fore. B. & B., A. T. & S. F., Newton, Kans. (1928)
Switzer, G., Gen. Supv. Struc. & Wk. Equip., W. P., Oakland, Calif. (1949)

T

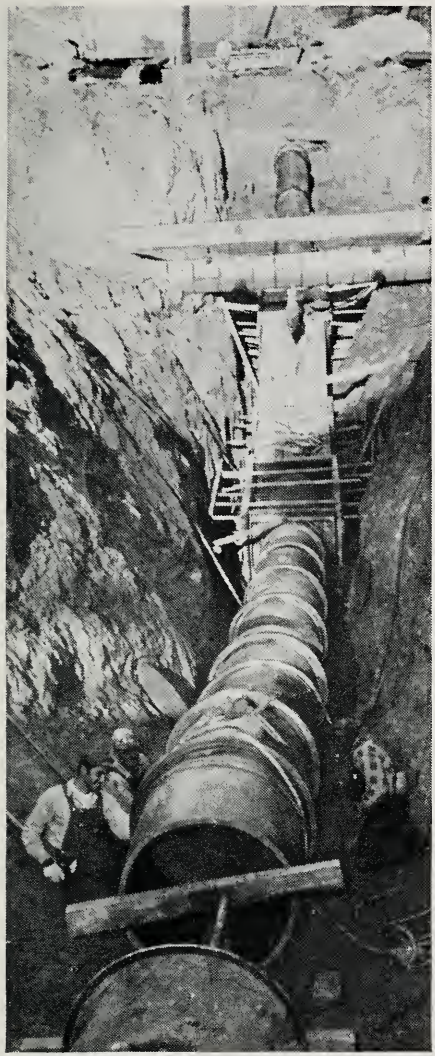
Talman, H. S., Gen. Supv. B. & B., C. & O., Richmond, Va. (1956)
Tange, M., Engr. Acct., T. & N. O., Houston, Tex. (1959)
Tanner, C. L., Gen. Fore. B. & B.-W. S., P. & S. F., Slaton, Tex. (1958)
Tardy, F. E., Asst. Div. Engr., S. P., Tucson, Ariz. (1953)
Taylor, F. H., Engr. M. of W., F. E. C., St. Augustine, Fla. (1951)
Taylor, W. L., B. & B. Supv., Sou., Jasper, Ala. (1950)
Templin, R. S., Fore. Carp., Reading, St. Clair, Pa. (1947)
Termunde, W. L., Asst. Rdm., B. Ry. of C., Chicago, Ill. (1956)
Thatcher, C. H., Jr., Asst. Engr., C. & N. W., Boone, Iowa (1958)
Thomason, C. G., Bldg. Insp., M. P., Harlingen, Tex. (1956)
Thrasher, H. A., Asst. B. & B. Mast., C. N., Toronto, Ont., Can. (1957)
Throckmorton, W. B., Ch. Engr., C. R. I. & P., Chicago, Ill. (1957)
Tieman, L. G., Asst. Div. Engr., C. & N. W., Boone, Iowa (1956)
Tilley, E. L., Br. Insp., I. C., Memphis, Tenn. (1956)
Todd, D. C., Asst. Engr., P. R. R., Pittsburgh, Pa. (1942)
Toh, J. S., Stud., Lehigh Univ., Bethlehem, Pa. (1956)
Tourtellotte, E. B., (Ret.), Consult. Engr., Greenfield, Mass. (1947)
Towle, C. L., Ch. Engr., D. T. & I., Dearborn, Mich. (1959)
Tracy, D. E., B. & B. Supv., S. P., El Paso, Tex. (1956)
Trenning, D. P., Drafts., C. M. St. P. & P., Chicago, Ill. (1959)
Trickey, R. E., Supt. B. & B., B. & A., Houlton, Me. (1957)
Trulove, J. D., B. & B. Supv., S. P., Ogden, Utah (1945)
Tyckoson, E. G., Asst. Ch. Carp., C. M. St. P. & P., Chicago, Ill. (1954)
Tyler, W. R., Jr., Div. Engr., U. P., Pocatello, Ida. (1959)

V

Vanderpool, G. R., Br. Engr.-West. Lines, A. T. & S. F., Amarillo, Tex. (1959)
Vandiver, V. J., Asst. B. & B. Supv., S. P., Dunsmuir, Calif. (1958)
Van Ness, R. A., (Ret.), Br. Engr., A. T. & S. F., Sebring, Fla. (1949)
Veldheer, H., Asst. Supv. B. & B., C. & O., Grand Rapids, Mich. (1959)
Von Behren, G., Asst. Supv. Struc., P. R. R., Baltimore, Md. (1956)
von Sprecken, R. E., Asst. Engr. M. of W., F. E. C., St. Augustine, Fla. (1951)
von Sprecken, T. M., Asst. to Ch. Engr., Sou., Washington, D. C. (1938)

W

Wachtel, C. D., Br. Insp., M. P., St. Louis, Mo. (1958)
Wachter, C. E., B. & B. Mast., C. N., Port Authur, Ont., Can. (1957)
Wade, E. B., Asst. Div. Engr., T. & N. O., San Antonio, Tex. (1959)
Wagner, W. R., Div. Engr., C. & N. W., Green Bay, Wis. (1957)
Walker, D. L., Gen. Fore. B. & B.-W. S., St. L.-S. F., Springfield, Mo. (1959)
Walker, P. M., Asst. B. & B. Supv., M. P., Little Rock, Ark. (1959)



In Nebraska—Here a section of cast iron pipe is being relocated. Twenty-five years old, the pipe is still in excellent condition—has never required major repair . . . or replacement.

DON'T BE FOOLED BY INITIAL PIPE COSTS...

You save with cast iron pipe

Sometimes the first cost of jobs where cast iron pipe is specified, is higher than similar projects using cheaper pipe. Yet, in the long run, cast iron pipe costs *less!* Here's why:

- Cast iron pipe rarely requires repairs. Its rugged construction, corrosion-resistant qualities and bottle-tight rubber-ring joints will withstand the most severe pressures. Once an investment is made in cast iron pipe, it is usually your first and last cost because of the absence of maintenance or repairs.
- Cast iron pipe is built to *last*—99 American cities will testify to that. They've had cast iron pipe installations in constant use for over a century! In fact, in Versailles, France, they're still using cast iron pipe water mains that were laid in 1664! Once cast iron pipe is in the ground, it stays there!

Don't be fooled by "low-cost" pipe. Insist on the pipe that will actually save you money over a period of years . . .

CAST IRON PIPE

THE MARK OF THE 100-YEAR PIPE

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director • 3440 Prudential Plaza, Chicago 1, Illinois

Walker, S. C., Supv. Struc., P. R. R., Philadelphia, Pa. (1958)
Wall, E. G., Div. Engr., G. M. & O., Bloomington, Ill. (1942)
Wall, R., Supv. B. & B., Sou., Selma, Ala. (1948)
Wallace, C. E., (Ret.), Gen Fore. B. & B.-W. S., St. L.-S. F., Springfield, Mo. (1948)
Walsh, V. A., Jr., Drafts., C. & W. I.-Belt Ry. of Chi., Chicago, Ill. (1958)
Walton, W. F., Gen. Fore. B. & B.-W. S., A. T. & S. F., Las Vegas, N. M. (1959)
Wang, A. B., Supv. B. & B., Monon, Lafayette, Ind. (1950)
Ware, W., Div. Engr., C. R. I. & P., Little Rock, Ark. (1956)
Warfield, H. Jr., (Ret.), Insp. M. of W., P. R. R., New Brunswick, N. J. (1952)
Warfield, W. B., Supv. Struc., P. R. R. - P. R. S. L., Camden, N. J. (1951)
Warren, J. A., B. & B. Insp., M. P., San Antonio, Tex. (1955)
Warrenfells, J. F., Ch. Engr., Jack. Term., Jacksonville, Fla. (1946)
Waterman, L. B., Engr. Maint. Equip., B. & O., Baltimore, Md. (1959)
Watkins, J. F., B. & B. Supv., Sou., Valdosta, Ga. (1958)
Weatherly, H. E., Off. Engr., T. & N. O., San Antonio, Tex. (1950)
Weaver, W. R., Ch. Mech. Off. & Ch. Engr., P. & S., Brookville, Pa. (1951)
Webber, G. R., B. & B. Fore., C. M. St. P. & P., Tacoma, Wash. (1948)
Weeks, A. H., B. & B. Insp., N. Y. C., Watertown, N. Y. (1957)
Weikal, J. K., Asst. Div. Engr., Erie, Hornell, N. Y. (1959)
Welch, J. W., Supv. B. & B., F. E. C., St. Augustine, Fla. (1943)
Welch, V. J., Prin. Asst. Engr., B. & A., Houlton, Me. (1958)
Weller, R. C., Div. Engr., C. N., London, Ont., Can. (1957)
Weyand, J., Drafts., U. P., Denver, Colo. (1958)
White, L. H., Supv. B. & B., I. C., New Orleans, La. (1946)
White, R. D., Div. Engr., St. L.-S. F., Ft. Smith, Ark. (1959)
White, S., Gen. B. & B. Supv., S. P., San Francisco, Calif. (1946)
Wiemer, H. C., B. & B. Supv., N. P., Duluth, Minn. (1957)
Wiklund, W. W., Asst. Supv. B. & B., G. N., Havre, Mont. (1955)
Wilcoxson, W. D., Asst. Supv. B. & B., L. & N., Latonia, Ky. (1959)
Wilkin, R. L., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1959)
Williams, C., Asst. Supv. B. & B., C. & O., Ashland, Ky. (1950)
Williams, D. R., Br. Insp., C. & E. I., Danville, Ill. (1956)
Williams, J. B., Asst. Ch. Engr., S. I., Spokane, Wash. (1959)
Williams, J. R., Asst. Engr. Br., C. R. I. & P., Chicago, Ill. (1959)
Williams, L. L., B. & B. Supv., L. & N., Mobile, Ala. (1959)
Williams, N. H., Engr. Trk., D. & H., Albany, N. Y. (1947)
Wilson, H. E., Asst. Ch. Engr.-Sys., A. T. & S. F., Chicago, Ill. (1959)
Wilson, H. M., Supv. Struc., P. R. R., Chicago, Ill. (1953)
Wilson, R. P., Supv. B. & B., C. & O., Hinton, W. Va. (1948)
Winn, J. J., Div. Engr., B. & M., Concord, N. H. (1959)
Wintoniak, S. G., Supv. Struc., P. R. R., Chicago, Ill. (1953)
Wistrich, H. A., Ch. Engr., L. V., Bethlehem, Pa. (1938)
Witherspoon, J. P., Mast. Carp., S. A. L., Savannah, Ga. (1948)
Wohlschlaeger, M. A., Asst. Engr., M. P., St. Louis, Mo. (1958)
Wold, O. R., B. & B. Supv., N. P., Spokane, Wash. (1957)
Wood, R. E., Supv. B. & B., G. N., Great Falls, Mont. (1954)
Woodward, J. D., Supv. Struc., L. I., Jamaica, N. Y. (1952)
Woolford, F. R., Ch. Eng., W. P., San Francisco, Calif. (1950)
Worden, R. K., Gen. Fore. B. & B.-W. S., G. C. & S. F., Ft. Worth, Tex. (1954)

Y

Yaw, D. M., Mast. Carp., Erie, Buffalo, N. Y. (1951)
Youngblood, R. A., Proc. Supt. B. & B., C. of G., Savannah, Ga. (1957)

Z

Zapfe, E. J., Asst. Ch. Engr. & Supt. B. & B., G. B. & W., Green Bay, Wis. (1952)
Zimmerman, C. B., Asst. Arch., Sou., Knoxville, Tenn. (1957)

Fairmont

RAILWAY MOTOR CARS
AND WORK EQUIPMENT

INSPECTION MOTOR CARS	SPOT TAMPERS
SECTION MOTOR CARS	BRIDGE TOOLS
GANG MOTOR CARS	TIE REMOVERS—HYDRAULIC
PUSH CARS AND TRAILERS	TIE HANDLERS—HYDRAULIC
HY-RAIL MOTOR CARS	RAIL LIFTERS
BALLAST MAINTENANCE CARS	TIE BED SCARIFIERS
WEED MOWERS	SPIKE PULLERS—HYDRAULIC
WEED SPRAYERS	TIE UNLOADERS
WEED BURNERS	TIE NIPPERS
EXTINGUISHER CARS	CRIB REDUCERS
DERRICK CARS	TIE BRUSHES
GROUTING OUTFITS	TIE SPRAYERS
OIL SPRAYERS	TIE COATERS

Performance ON THE JOB COUNTS

FAIRMONT RAILWAY MOTORS, INC., FAIRMONT, MINNESOTA

LIFE MEMBERS

Joined In

A

Anderson, J. L., (Ret.), Supv. B. & B., M. P., Osawatomie, Kans. 1931
Anderson, R. D., (Ret.), Div. Engr., C. & N. W., Marvin Hughitt Hotel, Huron, S. D. . 1923

B

Batey, W. A., (Ret.), Const. Engr., U. P., 4303 South St., Lincoln, Nebr. 1918
Borchert, W. C., (Ret.), Div. Engr., L. & A., Shreveport, La. 1942
Bost, M. A., (Ret.) Asst. Engr., C. M. St. P. & P., 322 S. Carolina, Mason City, Iowa . . . 1935
Brice, W. T., (Ret.), B. & B. Mast., C. N., General Delivery, Riverhurst, Sask., Can. 1946
Budzenski, F. N., (Ret.), Supr. B. & B., C. & N. W., 800 Pine St., Antigo, Wis. 1938
Bunge, W. H., (Ret.), Asst. Engr., M. P., 1822 Sul Ross, Houston, Tex. 1941

C

Carothers, M. D., (Ret.), Asst. Ch. Engr., G. M. & O., 705 E. Washington, St., Bloomington, Ill. 1938
Christianson, H. B., (Ret.), Spec. Engr., C. M. St. P. & P., P. O. Box 2500, Shelter Bay, Que., Can. 1928
Church, H. M., (Ret.), Gen. Supv. B. & B., C. & O., 509 No. Blvd., Richmond, Va. 1939
Colvin, A. A., (Ret.), Div. Engr., C. & N. W., 1000 Prospect Ave., Norfolk, Nebr. 1937
Converse, D. W., (Ret.), Br. Engr., A. C. & Y., 360 Litchfield Road, Akron, Ohio 1940
Cota, G. M., (Ret.), Ch. Clk. Engr. Dept., C. of V., Box 114, St. Albans, Vt. 1913
Cramer, F. H., (Ret.), Br. Engr., C. B. & Q., 2739 Agatite Ave., Chicago, Ill. 1927

D

Dick, H. M., (Ret.), Supv. Struc., P. R. R., 302 Walnut Circle, Shiremanstown, Pa. 1942
Duchac, J. V., (Ret.), Supv. B. & B., C. & N. W., Antigo, Wis. 1927

E

Engman, V. E., (Ret.), Ch. Carp., C. M. St. P. & P., 3429 - 17th Ave., So., Minneapolis 7, Minn. 1920

F

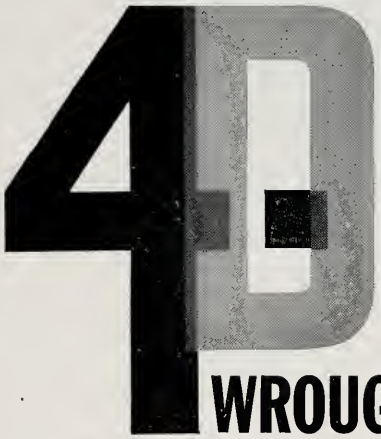
Flanagan, F. L., (Ret.), Ry. Sls., Valspar Corp., Detroit Graphite Div., 7701 W. 47th St., Lyons, Ill. 1937

G

Geyer, C. J., (Ret.), Vice Pres., C. & O., 1412 Wilmington Ave., Richmond, Va. 1928
Gillette, J. E., (Ret.), Carp. Fore., C. M. St. P. & P., c/o Carp. Fore., C. M. St. P. & P. Mazomanie, Wis. 1923
Gillis, A. D., (Ret.), B. & B. Supv., N. Y. N. H. & H., 35 Grosvenor Ave., Providence 8, R. I. 1923
Glander, A. M., (Ret.), Ch. Carp., C. M. St. P. & P., 2008 Lake Shore Dr., Austin, Minn. 1936
Gunderson, E., (Ret.), Supt. B. & B., C. St. P. M. & O., 705 Division St., Eau Claire, Wis. 1927
Guppy, B. W., (Ret.), Engr. Struc., B. & M., 52 Stratford Rd., Melrose, Mass. 1914

IN THESE APPLICATIONS

Ballast deck plates • Tie spacer bars • Electrical conduit • Girder cover and protection plates • Bridge railings • Bridge drainage systems • Trough plates • Pier protection plates • Transfer bridge pontoons • Signal and bridge warning masts • Fire curtains



WROUGHT IRON checks corrosion, prevents premature fatigue failure

On bridge applications, corrosion and fatigue failure take a daily toll from the life expectancy of ordinary metals. 4-D Wrought Iron is different. It's a unique composition of iron silicate fibers and high purity iron. And, this difference gives 4-D Wrought Iron the ability to absorb the relentless punishment of corrosion, shock and vibration.

HOW 4-D WROUGHT IRON FIGHT CORROSION

The iron silicate in 4-D Wrought Iron actually *puts corrosion to work.* 4-D's mechanical barrier of fibers detours corrosion and forces it to extend over the surface of the metal in an adherent, *protective* coating. Only 4-D Wrought Iron offers this kind of protection from corrosion.

WHAT ABOUT FATIGUE FAILURE?

In resisting fatigue, the iron silicate fiber network is again the key. With most metals, fractured ends correspond to a broken lump of sugar. Fibrous 4-D Wrought Iron, when fractured, resembles a splintered hickory plank. 4-D's unique structure minimizes stress concentrations caused by shock and vibration—prevents early fatigue failure.

For additional information, write for our railroad bulletin. It describes other applications where 4-D Wrought Iron's resistance to corrosion and fatigue has provided low cost per year of service.

BYERS 4-D WROUGHT IRON

TUBULAR AND FLAT ROLLED PRODUCTS
Railroad Sales Headquarters: 1120 Girard Trust Building
Philadelphia 2, Pennsylvania • Offices throughout the country

Joined In

H

Hancock, J. S., (Ret.), Br. Engr., D. T. & I., 15360 Piedmont, Detroit, Mich. 1916
Hand, G. W., (Ret.), Asst. to Pres., C. & N. W., 412 Courtland Ave., Park Ridge, Ill. . . 1909
Harding, C. R., (Ret.), Pres., The Pullman Co., Route 4, Box 177, Easton, Md. 1924
Harman, W. C., (Ret.), Supv. B. & B., S. P., 656 Cedar St., San Carlos, Calif. 1911
Heiszenbuttel, H., (Ret.), B. & B. Supv., C. & N. W., 808 So. 3rd St., Norfolk, Neb. . . 1917
Hemstad, B., (Ret.), Mast. Carp., G. N., 1120 Becker Ave., West, Willmar, Minn. 1937
Heuss, C. W., (Ret.), Supv. B. & B., C. C. C. & St. L., 2184 South Road,
Pennfield, N. Y. 1919
Hillman, A. B., (Ret.), Ch. Engr., Belt Ry. of Chi.-C. & W. I.,
7513 S. Carpenter St., Chicago 20, Ill. 1942
Hillman, F. W., (Ret.), Asst. Engr. M. of W., C. & N. W., 1452 Oak Ave.,
Evanston, Ill. 1917
Huckstep, W. A., (Ret.), Gen. Bldg. Supv., M. P. 3126 E. Linden St., Tucson, Ariz. . . 1941
Huntsman, F. C., (Ret.), Asst. Engr., Wabash, 7421 Bruno Ave., St. Louis 17, Mo. 1922

J

Jackman, H. E., (Ret.), Mast. Carp., B. & O., 570 Eastern Ave., Chillicothe, Ohio 1944
Johnson, M., (Ret.), Prin. Asst. Engr., I. C., Broadview Hotel, 5540 Hyde Park
Blvd., Chicago, Ill. 1915
Johnson, R. W., (Ret.), Asst. Engr., C. M. St. P. & P., 1131 Ave. C., Yuma, Ariz. 1922
Jones, A. C., (Ret.), B. & B. Supv., Sou., Birmingham, Ala. 1938

K

Kemmerer, W. G., (Ret.), Engr. B. & B., P. R. R., 508 Rockavon Rd.,
Narberth, Pa. 1931

L

Lacher, W. S., (Ret.), Secy., A. R. E. A., 407 E. Fuller Rd., Hinsdale, Ill. 1922
Lampson, W., (Ret.), Supv. B. & B., M. C., 170 Caleb St., Portland, Me. 1930
Landstrom, C. A., (Ret.), Mast. Carp., C. B. & Q., 1311 S. 3rd St., Burlington, Ia. 1928
Larsen, H. C., (Ret.), Struc. Iron Fore., C. St. P. M. & O., 1084 Sims Ave.,
St. Paul 6, Minn. 1928
Lord, H. T., (Ret.), B. & B. Mast., C. P., 415 Third St., So., Kenora, Ont., Can. 1940
Luck, R. P., (Ret.), Drafts., C. & N. W., 2429 W. Farragut Ave., Chicago 25, Ill. 1920

Mc

McDaniel, W. L., (Ret.), American-Marietta Co., Point Clear, Ala. 1945
McKay, A. G., (Ret.), Supv. B. & B., N. Y., H. & H., 11 Pine Island Road,
Jupiter Pt. Groton, Conn. 1915
McMahon, T. D., (Ret.), Arch., G. N., 223 Lake Avenue, White Bear Lake 10, Minn. . . 1918

M

Madson, H. C., (Ret.), Design., C. & N. W., 277 Columbia Ave., Elmhurst, Ill. 1940
Manley, B. F., (Ret.), Supv. B. & B., P. E., Box 197, Sunset Beach, Calif. 1916
Manning, D. A., (Ret.), Supv. B. & B., C. & N. W., 9120 Sherman Ave.,
Brookfield, Ill. 1939
Martens, W. F., (Ret.), Gen. Fore. B. & B., A. T. & S. F., 3396 Mayfield Ave.,
San Bernardino, Calif. 1924
Mateer, W. G., (Ret.), Mgr. of Pur. & Stores, E. J. & E., Chicago, Ill. 1944
Mead, E. L., (Ret.), Div. Engr., C. & N. W., 536 N. E. 69th St., Miami, Fla. 1923
Merwin, P. B., (Ret.), Asst. Engr., C. & N. W., Rte. 2, Box 565, Washougal, Wash. . . . 1929
Mottier, C. H., (Ret.), Vice Pres., I. C., 135 East Eleventh Place, Chicago, Ill. 1942

STOP RUST with RUST-OLEUM

When you apply Rust-Oleum 769 Damp-Proof Red Primer over a rusted surface after scraping and wire-brushing to remove rust scale and loose rust, its specially-processed fish oil vehicle penetrates the remaining rust to bare metal! Sandblasting and other costly preparation methods are usually eliminated. Radioactive tracer studies have proved Rust-Oleum Penetration.

All your rustable surfaces need Rust-Oleum. Contact your Rust-Oleum Railroad Rust Prevention Specialist, or write for your copy of the 30-page report on Rust-Oleum penetration, and the Rust-Oleum railroad catalog.

RUST-OLEUM CORPORATION
2735 Oakton St., Evanston, Ill.

MECHANICAL AND HYDRAULIC JACKS
SIMPLEX JACKS
for EVERY BRIDGE and BUILDING JOB

STANDARD SPEED
BRIDGE JACKS
25 ton capacity

The Simplex No. 2522 excels in ease and safety on heavy duty jobs. The mechanism is at the top rather than the base of the jack. The broad toe lift of 10 sq. inches is 4⅜" from ground level at minimum position. The new A2515 shown above has an aluminum housing, weighs only 42 lbs. It has a lift of 9" which eliminates resetting in bridgework. (Also Journal Jacks—15 to 50 tons.)

ALUMINUM ALLOY
JACK SUPPORT

With four of these supports and proper chains and jacks (No. A2515 particularly recommended) the heaviest timber structures are handled safely. Scientifically-designed for weight distribution — far stronger than wooden wedges. Easy to set. Can be used inverted with any jack to pull poles, etc.

RATCHET LOWERING LEVER—PUSH AND PULL AND THE MOST COMPLETE LINE OF HYDRAULIC JACKS AND PULLERS

TEMPLETON, KENLY & COMPANY
GARDNER ROAD • BROADVIEW, ILLINOIS

Joined In

N

Nies, A. B., (Ret.), Asst. Engr., N.Y.C., 408 Third St., Jackson, Mich. 1915

O

O'Brien, W. J., (Ret.), Dist. Carp., C.M.St.P. & P., Juneau County, Necedah, Wis. 1919

P

Parker, W. V., (Ret.), Gen. Fore. B. & B., St. L. S. W., R. R. #1, Box 122, Arlington, Tenn. 1911
Patenaude, E., (Ret.), B. & B. Mast., C. P., 133 John St., Sturgeon Falls, Ont., Can. 1930
Phillips, W. J., (Ret.), Asst. Gen. Br. Insp., S. P., 318 Arlington Ave., Berkeley, Calif. . . 1925
Piccone, C., (Ret.), Br. Engr., Nat.Rys. of Mex., Monte Everest 210, Lomas de Chapultepec, Mexico City, Mex. 1923
Podas, N. F., (Ret.), Ch. Engr., St. P. U. D. Co. & M. R. Ry. Co., 1238 Randolph Ave., St. Paul 5, Minn. 1937

R

Reece, A. N., (Ret.), Asst. to Pres., K. C. S., 2808 Verde Vista Dr., Santa Barbara, Calif. 1922
Richards, C. A. J., (Ret.), Asst. Supv. Struc., P. R. R., 2717 Woodland Hills Ave., Lakeland, Fla. 1924
Rights, H. T., (Ret.), Br. Engr., L. V., 1015 Raymond Ave., Bethlehem, Pa. 1927
Rintoul, D. T., (Ret.), Gen. Br. Insp., S. P., 2571 Glen Green, Hollywood 28, Calif. . . 1910
Roof, W. R., (Ret.), Br. Engr., C. G. W., 7728 So. Yates Ave., Chicago 49, Ill. 1927

S

Shobert, F., (Ret.), Sys. Steel Const. Fore., S. P., 2205 Manchester Dr., San Leandro, Calif. 1918
Singer, E. W., (Ret.), Supv. B. & B., N. Y. C. & St. L., 6727 3rd Ave. North, St. Petersburg, Fla. 1923
Smith, C. E., (Ret.), Vice Pres., N.Y. N.H. & H., 282 Prospect St., New Haven, Conn. . . 1911
Swartz, W. G., (Ret.), Engr. Acct., C. N., Box 2115, R. R. #5, Victoria, B. C., Can. 1917

T

Taggart, C. R., (Ret.), Supv. B. & B., N. Y. C., 514 N. Drexel Ave., Indianapolis, Ind. 1935
Tattershall, E. R., (Ret.), Supv. of Maint. Equip., N.Y.C., 21 Clay St., Malone, N. Y. . . 1913
Tetrault, L. J., (Ret.) B. & B. Fore., N. Y. N. H. & H., Providence, R. I. 1936
Thelander, P. V., (Ret.), Asst. Ch. Engr., C. & N. W., Chicago, Ill. 1939
Tucker, N. R., (Ret.), Asst. Div. Engr., T. & N. O., Houston, Tex. 1939

V

Varker, J. L., (Ret.), Spec. Engr., D. & H., 21 Archbald St., Carbondale, Pa. 1936

USS American Bridge builds

World's Longest Vertical Lift Span

The 71-year-old swing span carrying the Staten Island Rapid Transit Railway over the Arthur Kill between Staten Island, N. Y. and Elizabeth, N. J., has been replaced by a modern lift bridge. And there's an interesting story behind the event. When the 496'6" swing bridge was built in 1888, it was the longest in existence, a record it held for many years. It too, was fabricated and erected by American Bridge.

The imposing new bridge, with its 557'11½" thru truss vertical lift span, is also a record-breaker.

But great length is not the only feature about the new bridge. It is an imposing structure from every angle. Big, but not as heavy as it looks because most of the 1,658 tons of steel in it are USS MAN-TEN; the towers are 33' x 32' in width and 163'4" high; and even the vertical lift span itself is huge, being 43'4" deep at the end and increasing to 70' in the center. The old bridge, incidentally, will also be dismantled by American Bridge.

American Bridge has unmatched experience in railroad bridge construction. We have the know-how, the equipment and the personnel to handle such jobs with a minimum of interruption to traffic. We welcome an opportunity to discuss your bridge replacement or repair requirements. Just call or write the nearest office listed below.

USS and Man-Ten are registered trademarks

American Bridge Division of United States Steel

General Offices: 525 William Penn Place, Pittsburgh, Pa.

Contracting Offices In. Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit Elmira • Gary • Harrisburg, Pa. • Houston • Los Angeles • Memphis • Minneapolis • New York • Orange, Texas • Philadelphia • Pittsburgh Portland, Ore. • Roanoke • St. Louis • San Francisco • Trenton • United States Steel Export Company, New York

Joined In

W

Walker, G. P., (Ret.), Supv. B. & B., M. P., 909 Jackson St., Monroe, La. 1929
White, W. E., (Ret.), Gen. Fore., A. T. & S. F., 706 W. 6th St., Chanute, Kans. 1920
Whitehouse, B. M., (Ret.), Ch. Fire Insp., C. & N. W., 2008 Isabella St., Evanston, Ill. 1927
Winkelhaus, L. C., (Ret.), Arch. Engr., C. & N. W., 6921 Oriole Ave., Chicago 31, Ill. 1934
Womeldorf, C. F., (Ret.), Div. Engr., C. & N.W., 111 No. 12th St., Norfolk, Nebr. . . 1917
Wray, H. O., (Ret.), Secy. & Ch. Engr., T. C. T., 511 Bay Street, P. O. Box 1054, Texas City, Tex. 1939
Wright, C. W., (Ret.), Mast. Carp., L.I., 67 Nassau Pkwy., Oceanside, N. Y. 1908

Y

Yewell, J. E., (Ret.), Ch. Engr., B. & L. E., 32 Second Ave., Greenville, Pa. 1941

Z

Zinsmeister, E. C., (Ret.), Mast. Carp., B. & O., 303 - 12th Ave. No., St. Petersburg, Fla. 1905

ASSOCIATE MEMBERS

Joined In

A

Agee, J. L., Mgr.-Steel Bldg. Sls., Armco Drainage & Metal Prod., Inc. P. O. Box 1699, Houston, Tex. 1957
Akers, R. H., RR. Sls. Mgr., Armco Drainage & Metal Prod., 1516 Keith Bldg., Cleveland 15, Ohio 1958
Andrews, W. W., R. R. Sls. Engr., Armco Drainage & Metal Prod., Inc., 4345 Lyndale Ave., N, Minneapolis, Minn. 1958

B

Berkel, C. J., Lee Turzillo Contracting Co., P. O. Box 9232, Kansas City 15, Mo. 1959
Biggan, P. J., Slsman, W. E. Bugbee Ry. Equip. Co., 1802 Alamo National Bldg., San Antonio 5, Tex. 1958
Bishop, D. B., Dist. Mgr., Dearborn Chemical Co., 2 Gateway Center, Pittsburgh 22, Pa. 1946
Boulton, C. R., R. R. Contractor, 10 E. Town St., Columbus 15, Ohio 1946
Bowman, G., Prod. Mgr., Ottowa Steel, 15050 Vaughn, Detroit 23, Mich. 1959
Breitfuss, T. K., Engr. Rep., American-Marietta Co., Concrete Pords. Div., 101 E. Ontario St., Chicago 11, Ill. 1959
Brennon, L. D., M. of W. Instr., Air Reduction Sales Co., 620 King Drive, Pine Lake, Ga. 1950
Brietzke, W. F., Mgr. R. R. Mach., Pettibone Mulliken Corp., 4710 W. Division St., Chicago 51, Ill. 1956
Bryant, C. E. Jr., Johns-Manville Sls. Corp., 22 E. 40th St., New York, N. Y. 1951
Bugbee, W. E., Sls. Rep., Ry. Equipment, 1803 Alamo National Bldg., San Antonio 5, Tex. 1956
Buskirk, G. C., Agricultural Sls. Dept., U. S. Borax & Chem. Corp., 4100 X St., Lincoln 4, Nebr. 1949

FOR A LONGER-LASTING PAINT JOB

...specify Flame-Cleaning

Thorough cleaning and drying of steel surfaces is assured when LINDE's flame-cleaning method is used. In this procedure, high-temperature oxy-acetylene flames are passed over the work, dislodging dirt and soot, evaporating all moisture, and causing scale and rust to expand and pop off. The surface is then wire-brushed and painted while warm. This provides a more lasting paint job than when other metal-cleaning methods are used, for paint bonds tighter, spreads more evenly, and dries more quickly when applied to warm, dry metal.

The ease of applying LINDE's flame-cleaning . . . plus the high quality of the results obtained . . . have led to the use of this method to clean and dry all types of structural steelwork — train sheds, bridges, pipe, tanks, rail that is to be covered, and rolling stock of all kinds. Ask LINDE for information regarding a demonstration of this fast, efficient method for preparing steel surfaces for painting.

Railroad Department

LINDE COMPANY

30 East 42nd Street
New York 17, N. Y.

Linde

UNION CARBIDE

"Linde" and "Union Carbide" are trade-marks of Union Carbide Corporation.

Joined In

C

Clark, H., Indiana Sls. Mgr., Armco Drainage & Metal Prod., Inc., 1839 N. Meridian St., Indianapolis 20, Ind. 1953
Clarke, R., American-Marietta Co., P. O. Box 391, La Grange, Ill. 1948
Corporon, F. J., Comm. Rep., Motorola Comm. & Electronics Inc., 308 Earl Rd., Michigan City, Ind. 1950
Cross, E. T., Vice Pres., Armco Drainage & Metal Prod. Inc., Middletown, Ohio 1946
Cummins, C. P., Br. Engr., St. L. Co. Div. of Hiways, Clayton, Mo. 1948

D

Davidson, T., Asst. Mgr., Globe Chemical Company, 80 E. Jackson Blvd., Chicago, Ill. 1955
Denton, J. H., Sls. Engr., Southern Amiesite Asphalt Co., 3401 5th Ave., N., Birmingham, Ala. 1958
Detzel, G. E., Geo. E. Detzel Co., 1231 Draper St., Cincinnati 14, Ohio 1945
Deubel, H. R., Mgr. RR. Div., Chicago Pneumatic Tool Co., 936 E. 87th St., Chicago 19, Ill. 1956
Duffie, F. J., Engr. Serv. Repr., Linde Co., Oxweld R. R. Dept., 230 N. Michigan Ave., Chicago, Ill. 1946

E

Eaton, E. L., Dir. Fact. Rep., Strato-Tower Div., Young Spring & Wire, P. O. Box 103, Elkart, Ind. 1959
Eckert, F. L., Schramm, Inc., West Chester, Pa. 1958
Enstrom, W. A., Mgr. Trk. Mat'ls. Div., Pettibone Mulliken Corp., 4710 W. Division St., Chicago, Ill. 1956
Evans, R., R. R. Sls. Engr., Armco Drainage & Metal Prod., Inc., 20 N. Wacker Dr., Chicago 6, Ill. 1959
Evinger, F. W., R. R. Rep., The Leon Co., 3243 Euclid Ave., Apt. #2A, Berwyn, Ill. 1946

F

Fechtner, O. R., Div. Prod. Mgr., Pettibone Mulliken Corp., 4710 W. Division St., Chicago 51, Ill. 1956
Filkins, A. J., Pres., Filkins & Son Co., 299 N. Linden, Palatine, Ill. 1927
Fletcher, R. L., Struct. Engr., Timber Engineering Co., 1319 18th St., N. W., Washington, D. C. 1947
Flinn, L. E., Asst. Vice Pres. RR. Div., Dearborn Chemical Co., 375 Merchandise Mart, Chicago 54, Ill. 1949
Frederick, H. Z., Mgr., Ry. Sls. Div., The R. C. Mahon Co., Detroit 34, Mich. 1950

G

Gibboney, J. L., Vice Pres., Nat'l. Aluminate Corp., 422 No. Dover St., La Grange Park, Ill. 1949
Giles, J. M., Spl. Rep., Off-Track Equip., Caterpillar Tractor Co., Peoria 8, Ill. 1938
Glassgold, I. L., Pres., Masonry Resur. & Con. Co., Inc., B. & O. Coal Pier, Baltimore, Md. 1950
Grego, L. A., Sls. Engr. RR. Div., Pettibone Mulliken Corp., 141 W. Jackson Blvd., Chicago 4, Ill. 1956

BRIDGE TIE ANCHOR

The Bridge Tie Anchor offers an improved method for securing open deck bridge ties to supporting steel members and creates a strong spring pressure holding the tie and the supporting member firmly together. The spring action compensates for tie shrinkage, seating and stresses.

The Bridge Tie Anchor is low in cost, easy to install and economical to maintain.

Better get the facts, now!
Write, wire or phone for full literature

The RAILS Company

187 Maplewood Ave., Maplewood, N. J.
Offices: St. Louis, Mo., Chicago, Ill.

Joined In

H

Haarvei, O. A., Sls. Engr., Spider Staging Sls. & Serv. Co., 511 Fraces Ave., Loves Park, Ill. . . . 1958
Hansen, P. O., Ohio Sls. Mgr., Armco Drainage & Metal Prod., Inc., 1820 N. W. Boulevard, Columbus 15, Ohio . . . 1959
Hickey, J. F., Pres., Baker & Hickey Co., P. O. Box 5008, Tri-Village Sta., Columbus 12, Ohio . . . 1946
Higgs, J. A., Knoerle, Graef, Bender & Asso., 210 N. Calvert St., Baltimore 2, Md. . . . 1959
Hoelzel, W. N., Asst. Vice Pres. Sls., Screw & Bolt Corp. of American, Gary Div., 122 S. Michigan Ave., Chicago 3, Ill. . . . 1949
Hofer, P., East Dist. Mgr., Pettibone Mulliken Corp., 350 Fifth Ave., New York 1, N. Y. . . . 1956
Hoffman, T. E., Factory Rep., Zone Co., 2502 Wilson St., Falls City, Nebr. . . . 1949
Hoglund, C. B., Lee Turzillo Contracting Co., P. O. Box 9232, Kansas City 15, Mo. . . . 1959
Holderman, H. L., Sls. Rep., Bird & Son, Inc., 203 S. West Ave., Elmhurst, Ill. . . . 1951
Holmberg, V. V., Vice Pres., The Ellington Miller Co., 25 E. Jackson Blvd., Chicago 4, Ill. . . . 1942
Holmes, J. L., Rep., Bird & Son, Inc., 721 Second Ave., West Haven, Conn. . . . 1956
Holstein, F. W., Pres., Fred W. Holstein Co., Hopatcong, N. J. . . . 1948
Hopkins, W. S., Jr., Sls. Rep., Air Reduction Sls. Co., 409 S. Harrison St., Garrett, Ind. 1949

I

Itter, R. C., Sls. Corresp., Pettibone Mulliken Corp., 4710 W. Division St., Chicago 51, Ill. . . . 1957

J

Jacobson, A. E., Serv. Engr., Linde Air Prod. Co., 230 N. Michigan Ave., Chicago. Ill. . . . 1950
Johnson, I. K., Const. Supt., Linnan Const. & Engr., Inc., 3958 N. 54th St., Milwaukee 16, Wis. . . . 1953
Jones, E. L., Sls. Engr., American Crankshaft Co., 510 Morehead St., Charlotte, N. C. . . . 1957
Jones, J. A., Sls. Engr., West Coast Engine & Equip. Co., 1077 East Shore, Berkeley, Calif. . . . 1956

K

Kellogg, J., RR. Sls. Rep., National Lead Co., 111 Broadway, New York 6, N. Y. . . . 1956
Kelly, R. J., Kelly System Inc., 422 N. Western Ave., Chicago, Ill. . . . 1958
Kizak, S. F., Dist. Slsmn., National Painting & Oil Co., 5401 S. Laflin St., Chicago, Ill. 1956
Klosk, L., Contract. M. of W., New York City Transit Authority, 1555 Grand Concourse, New York 52, N. Y. . . . 1959

L

Lacey, J. W., Rep. R. R. Dept., Linde Air Products Co., 230 N. Michigan Ave., Chicago 1, Ill. . . . 194(
LaFortune, L., Ry. Sls., Detroit Graphite Div., The Valspar Corp., 7701 W. 47th St., Lyons, Ill. . . . 1959
Lipscomb, W. P., Mgr. RR. Sls., Armco Drainage & Metal Prod., Inc., P. O. Box 1699, Houston, Texas . . . 1956
Lloyd, F. G., Serv. Engr., Dearborn Chem. Co., Atlanta, Ga. . . . 1957
Loeffler, J. S., R. R. Sls. Mgr., Armco Drainage & Metal Prod., Inc., 4345 Lyndale Ave., N., Minneapolis, Minn. . . . 1955
Lunde, A. C., Ry. Sls., Detroit Graphite Div., The Valspar Corp., 7701 W. 47th St., Lyons, Ill. . . . 1959
Luther, L. A., Serv. Engr., Ingersoll Rand Co., 1121 Hamilton Ave.. Palo Alto Calif. . . . 1945
Lynch, J. K., Dist. Sls. Mgr., Con. Prod. Div., American Marietta Co., 3431 - 27th Ave., No., P. O. Box 5563, No. Birmingham Sta., Birmingham 3, Ala. . . . 1951
Lyon. C. A., Spec. Asst. to V. P. for Market., The Master Builders Co., 7016 Euclid Ave., Cleveland 3, Ohio . . . 1945

to Stop weeds...

Concentrated BORASCU®
POLYBOR-CHLORATE®
UREABOR®
MONOBOR-CHLORATE®

These borate weed killers are proving best for roads in every way... *efficiency, safety, economy, convenience, easy application.*

Today's use of borates for maximum control of vegetation began years ago with our pioneer work in the field. Continued research has developed the group of herbicides, listed above, which most roads now favor for every phase of weed control. These four weed killers are nonselective. They are widely used for year-round maintenance of weed-free conditions about trestles, tie piles, yards, signals, switches, and rights of way. Find out how you, too, can do a better job on weeds...write today.

AGRICULTURAL SALES DEPARTMENT

United States Borax & Chemical Corporation

630 SHATTO PLACE • LOS ANGELES 5, CALIFORNIA

Joined In

Mc

McFarland, J. R., Pres., L. D. McFarland Co., Sandpoint, Ida. 1959
McMahon, R. D., Sls. Engr., Fabreeka Prod. Co., 16 S. Broad St., Philadelphia, Pa. 1955

M

Mabry, D. B., Mgr. Lumb. Sls., T. J. Moss Tie Co., 700 Security Bldg., St. Louis, Mo. . . . 1948
Mann, E. A., Pres., Champion Transportation Sls., Inc., 222 W. Adams St., Chicago 6, Ill. 1951
Maurer, S. S., West. Div. Mgr., Fabreeka Prod. Co., 325 W. Huron St., Chicago 10, Ill. 1952
Myers, D. R., Sls. Rep., R. R. Sls., Patterson Sargent Co., 1882 S. Normal Ave., Chicago 16, Ill. 1952

N

Needham, L. H., Pres., The Penetryn System, Inc., 2294 Scranton Rd., Cleveland Ohio . . 1946
Nicholson, L. P., Ry. Rep., Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill. 1958
Nuckols, L. T., Engr. Consult., % Greenbrier Hotel, White Sulphur Springs, W. Va. . . . 1951

P

Patterson, R., Const. Consult., 80 E. Jackson Blvd., Chicago 4, Ill. 1946
Patton, R. C., Roy C. Patton Co., 3416 Silver Palm Rd., Jacksonville Beach, Fla. 1952
Phillips, R. O., Asst. to Pres., The Zone Co., Fireplate Div., P. O. Box 789, Fort Worth, Texas 1956
Piepmeier, A. L., Vice Pres., Turner Engineering Co., 112 Union St., Nashville 3, Tenn. 1953
Pinnell, R. A., Jr., Pres., Lift Slab Research & Development, 8546 Broadway, San Antonio, Tex. 1959

R

Roof, W. B., Const. Engr. & Asst. to R. R. Sls. Vice Pres., Armco Drainage & Metal Prod., Inc., Curtis St., Middletown, Ohio 1958
Ruhl, D. A., R. R. Engr., Ordnance Corps, U. S. Army, Joliet, Ill. 1948

S

Schneider, C. A., Pres., Schneider Const. Co., Inc., 3004 W. Dallas Ave., Houston, Texas 1956
Scott, J. M., Sls., The Arco Co., 614 Delaware St., Scranton 9, Pa. 1945
Scroggs, J. E., Mgr. R. R. Dept., Carter-Waters Corp., 2440 Pennway, Kansas City, Mo. 1958
Smith, D. C., Sls. Mgr., Wood Pres. Div., Koppers Co., Inc., 750 Koppers Bldg., Pittsburgh 19, Pa. 1958
Smith, F. C., R. R. Dept., Marsh & McLennan, Inc., 231 S. LaSalle St. Chicago 4, Ill. . . 1948
Stiles, C. C., Vice Pres., The Zone Co., 917 N. Main, Ft. Worth, Texas 1957

T

Thoresen, H. B., Slsmn., Globe Chemical Co., 80 E. Jackson Blvd., Chicago, Ill. 1955
Truss, F. W., Mgr., RR. Sales, Armco Drainage & Metal Prod. Inc., 10 S. Brentwood Blvd., Clayton 5, Mo. 1946
Twomey, J. F., Vice Pres., McCracken Contracting Co., 7340 S. Western Ave., Chicago, Ill. 1956

at your service

for
all types of cranes
diesel wreckers
pile drivers
buckets

ORTON

CRANE & SHOVEL CO.
608 S. DEARBORN ST.
CHICAGO 5, ILLINOIS

PHILO A. ORTON, President

Swedish Training Co.	Stockholm 16, Sweden
Oy. Exim Ab.	Helsingfors, Finland
Southern Cross Engineering & Foundry Works	Ponce, Puerto Rico
O. Phillipp & Co., Inc.	New York 6, N. Y.
Contractors Machinery & Equipment Ltd.	Hamilton, Ont., Canada
Mussens Canada Ltd.	Lachine, Que., Canada
J. L. Praytor	Birmingham, Ala.
Clark Equipment Co.	Little Rock, Ark.
Bevis Machinery Co.	Los Angeles 13, Calif.
Sunset Equipment Co.	San Francisco 11, Calif.
King & East Machinery Corp.	Denver 11, Colorado
Arnold Machinery Co.	Boise, Idaho
Arnold Machinery Co.	West Falls, Idaho
Ceder Equipment Co., Inc.	Louisville 1, Ky.
Ceder Equipment Co., Inc.	Lexington, Ky.
L. A. Whitney Co., Inc.	Needham 94, Mass.
Arnold Hughes Co.	Detroit 26, Mich.
St. Louis Railway Supply Co.	St. Louis 1, Mo.
N. C. Riddle Co.	Albuquerque, N. M.
J. C. Lembo Machine Corp.	Corona 68, N. Y.
J. C. Lembo Machine Corp.	Huntington, L. I., N. Y.
Spartan Equipment Co.	Charlotte, N. C.
Industrial Handling Associates	Cleveland 2, Ohio
Guthrie Machinery Co.	Portland 18, Oregon
John W. Patterson Co.	Carnegie, Pa.
Edelen & Boyer Co.	Philadelphia 45, Pa.
Tri-State Equipment Co., Inc.	Memphis 2, Tenn.
Pan-American Engineering Co.	Dallas, Texas
Arnold Machinery Co.	Salt Lake City 1, Utah
Washington Machinery Co.	Seattle 8, Wash.
Hunter Machinery Co.	Green Bay, Wis.
Hunter Machinery Co.	Milwaukee 3, Wis.

Joined In

V

VanWolf, A. F., Gen. Mgr., Kedmont Waterproofing Co., 53 W. Jackson Blvd., Chicago 4, Ill. 1955
Von Kampen, K., Ch. Engr., Pettibone Mulliken Corp., 4710 W. Division St., Chicago 51, Ill. 1956

W

Walters, W. R., 1535 Rand Tower, Minneapolis, Minn. 1949
Weiss, W. E., Sls. Engr., Pettibone Mulliken Corp., 4710 W. Division St., Chicago 51, Ill. 1956
Wicker, W. S., Ch. Engr., Transportation Mutual Ins. Co., 128 Terrace Drive, N. E., Atlanta 5, Ga. 1953
Wilhite, D. L., R. R. Rep., U. S. Borax & Chem. Corp., 3456 W. Peterson Ave., Chicago 45, Ill. 1957
Williams, C. B., Pres., Ever Tight Bolt Assembly Co., 238 Lincoln Ave., Council Bluffs, Ia. 1954
Williams, G. S., Supt., Southern Amiesite Asphalt Co., Inc., 3401 5th Ave. No., Birmingham, Ala. 1956
Williams, H. A., Sls. Engr., Fabreeka Prod. Co., Inc., 8137 N. Ridgeway, Skokie, Ill. 1959
Wilson, W. C., Pres., Southeastern Ry. Supply, Inc., P. O. Box 368, Arlington 10, Va. 1951
Wingerson, C., Ry. Sls. Engr., Screw & Bolt Corp. of American, P. O. Box 1708, Pittsburgh 30, Pa. 1954

AMERICAN-MARIETTA COMPANY

101 E. Ontario St. Chicago 11, Ill.

Offers

MASSEY CONCRETE PRODUCTS

with

50 Years of Service to American Railroads

Sales Offices and Plants throughout the United States

See Pocket List of Railroad Officials for nearest District Office

Prestressed Structural Members

Precast Piling - Bridge Slabs

Culvert Pipe - Flatbase Pipe - Cribbing

Relay Houses - Battery Boxes - Signal Foundations

For fast, easy control of weeds and brush, use one of these effective DuPont Chemicals

TELVAR®
monuron weed killer

Just one application of Du Pont "Telvar" monuron or "Karmex" diuron weed killer controls weeds for a season or longer. "Telvar" and "Karmex" used separately or in combination with other chemicals or weed oil, provide the base for efficient, economical weel-control programs, and reduce annual maintenance costs.

KARMEX®
diuron weed killer

The selection of the proper Du Pont weed killer, "Telvar" or "Karmex" depends on various conditions of soil type and moisture. Du Pont Weed-Control Specialists are ready to aid you in choosing the proper chemical and in planning an efficient and economical weed-control program. "Telvar" and "Karmex" are wettable powders, and are non-volatile, non-flammable, non-corrosive and low in toxicity to humans and livestock.

AMMATE®
weed and brush killer

Where brush is a problem, use Du Pont "Ammate" Weed and Brush Killer. "Ammate" assures long-term brush control, which means lower maintenance costs. Because "Ammate" is non-volatile, it can be used on rights-of-way, even when they adjoin cropland planted to sensitive crops.

DYBAR®
fenuron weed and brush killer

New Du Pont "Dybar" fenuron weed and brush killer is a pelleted product for dry application to the ground. It's easy to apply by hand or broadcast equipment. Any way, a greater payload is possible with "Dybar" over liquid sprays.

DU PONT
REG. U.S. PAT. OFF.

Better Things For Better Living
. . Through Chemistry

E. I. DU PONT DE NEMOURS & CO. (INC.)
Industrial and Biochemical Dept.
Wilmington 98, Delaware

MEMBERSHIP BY ROADS

* Indicates Junior Member

Akron, Canton & Youngstown

Converse, D. W. (Ret.)

Alaska

Cannon, B. E.
Rainwater, C. W.

Atchison, Topeka & Santa Fe
(Incl. G. C. & S. F.—P. & S. F.)

Baker, G. A. (GC&SF)
Beeder, R. H.
Bisbee, R. D. (P&SF)
Clark, W. H. (P&SF)
Cole, G.
Cook, J. C., Jr. (GC&SF)
Corbett, R. K.
Davis, L. H. (Ret.)
Gates, C. A.
Gipson, C. G.
Hamilton, W. A., Jr. (GC&SF)
Heinlen, R. H. (GC&SF)
Higgins, L. H.
Huckabay, J. B.
Hyma, W. R.
Johnston, G. H.
Martens, W. F. (Ret.)
Pritchard, B. L. (P&SF)
Reese, C. M. (GC&SF)
Sampson, H. L.
Sandberg, C. H.
Sweet, W. A.
Tanner, C. L. (P&SF)
Vanderpool, G. R.
Van Ness, R. A. (Ret.)
Walton, W. F.
White, W. E. (Ret.)
Wilson, H. E.
Worden, R. K. (GC&SF)

Atlanta & West Point-Western Ry. of Alabama—Georgia

Phelps, C. E.

Baltimore & Ohio
(Incl. B. & O. C. T.)

Atkins, A. I.
Babbitt, J. H.
Barnhart, E. H.
(Ret.) (Hon.)
Bell, D. V.
Bleul, G. J.
Brown, W. S.
Buckmaster, W. A. (BOCT)
Burrows, C. D.
Caywood, J. A.
Clark, A.
Crites, G. S. (Ret.) (Hon.)
Cummings, E. M.
Curie, H. D.
Ellerbrock, D. T.
Enderle, R. E.
Gillespie, W. G.
Gilmore, R. W.
Green, C. C.
Hemmeter, L. F.
Hutson, H. O.
Jackman, C. E.
Jackman, H. E. (Ret.)
Jarrell, M.
Pound, E. R.
Riley, C. R.
Rymer, J. R.
Seitz, H.
Simpson, L. W.
Smith, G. A.
Sturman, J. J.
Waterman, L. B.
Zinsmeister, E. C. (Ret.)

MONOTUBE PILES

for railroad structures

UNION METAL tapered, fluted Monotube piles offer features that mean savings in all kinds of foundation work.

This saving starts with simple on-the-job weld splicing to extend piles to any required length. Cut-offs are quick and easy, too.

Light weight combined with cold-rolled strength means easier handling and faster pile driving.

These and other Union Metal advantages add up to faster job completion, and reduced construction costs. Write today to The Union Metal Manufacturing Company, Canton 5, Ohio, for your copy of Catalog No. 91.

UNION METAL

Monotube Foundation Piles

Bangor & Aroostook

Garcelon, C. E.
Trickey, R. E.
Welch, V. J.

Belt Ry. of Chicago—Chicago & Western Indiana

Hillman, A. B. (Ret.)
Lieser, H. J. (C&WI)
Murray, D. J.
Termunde, W. L. (BRyC)
Walsh, V. A., Jr.

Bessemer & Lake Erie

Foreman, J. E., Jr.
Howe, W. C.
Ridgeway, J. J.
Yewell, J. E. (Ret.)

Boston & Maine

Benson, O. C.
Gamble, H. H.
Guppy, B. W. (Ret.)
MacDonald, J. J.
Meserve, E. S.
Ross, R. F.
Spofford, F. R.
Winn, J. J.

Camas Prairie

Cash, E. E.

Canadian National
(Incl. G. T. W.—C. V.)

Booth, H. E.
Brice, W. T. (Ret.)
Collins, A. T.
Cota, G. M. (Ret.) (CV)
Dixon, N.
Frost, L. M. (GTW)
Halliday, H. C.
Hamilton, A. R. G.
Johnson, B. L.
Kilby, J. T.
Langlois, J. E. R.
Leinweber, F. J.
Lundgren, H. M.
McMillan, R. J.
MacQuarrie, A. C.
Malone, W. J. (GTW)
St. Pierre, M. P.
Swartz, W. G. (Ret.)
Thrasher, H. A.
Wachter, C. E.
Weller, R. C.

Canadian Pacific

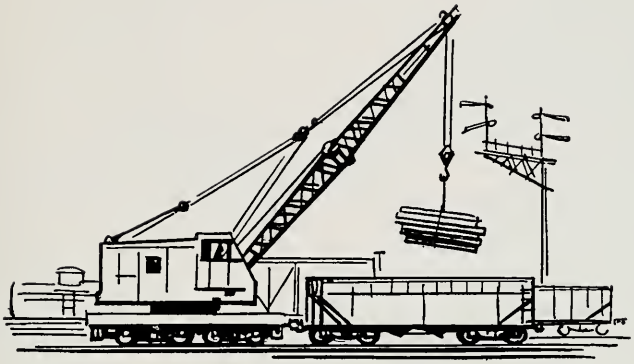
Creighton, J. H.
Fox, J.
Lord, H. T. (Ret.)
Patenaude, E. (Ret.)
Price, A. C.
Rose, J. A.

Central of Georgia

Benson, G. W.
Chapman, W. E.
Youngblood, R. A.

Chattahoochee Valley

Neal, G. W.



WELLMAN*
LOCOMOTIVE CRANES

Versatile, powerful, only Wellman Locomotive Cranes offer:

- Double-Row Ball-Race Rotation
- Full Vision Cab
- Sixty Years of Engineering Progress
- World Wide Acceptance
- Capacities from 25 to 80 tons

Catalog Available on Request

LOCOMOTIVE CRANE DIVISION
THE WELLMAN ENGINEERING COMPANY
113 ST. CLAIR AVE. NE, CLEVELAND 14, OHIO

**Successor to Browning Locomotive Crane*

Chesapeake & Ohio
(Incl. N. F. & G.)

Allen, W. V.
Boehling, H. A., Jr.
Brown, L. W.
Caines, W. W.
Christian, J. E. (NF&G)
Church, H. M. (Ret.)
Dickison, C. S.
Dunn, W. M. S.
Ellis, J. S.
Geyer, C. J. (Ret.)
Graham, W. R.
Haines, P.
Harlow, H. M.
Heck, J. E.
Hecker, R. L.
Hubbard, M. J.
Hull, F. G.
Hutcheson, F. W.
Hutcheson, W. A.
Jones, E. B.
Koehler, P. L.
Mitchell, D. N.
Nicely, O. P.
O'Brien, J. B.
Reid, R. H.
Scites, P. E.
Talman, H. S.
Veldheer, H.
Williams, C.
Wilson, R. P.

Chicago & Eastern Illinois

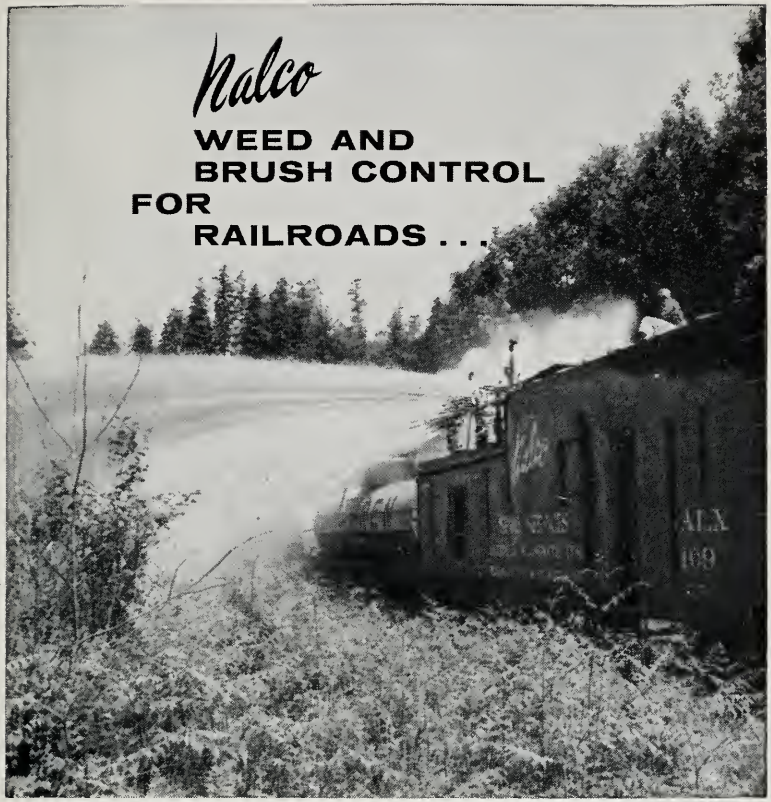
Baker, R. C.
Brown, K. R.
Moore, I. A.
Ogle, H.
Rice, E. D.
Smith, A. P.
Williams, D. R.

Chicago & Illinois Midland

Hawley, I. H.
Peterson, N. E.

Chicago & North Western
(Incl. C. St. P. M. & O.)

Anderson, R. D. (Ret.)
Armstrong, W. F.
Babcock, D. L.
Bangs, E. L.
Barnes, J. A.
Barr, H. L.
Barsema, M.
Beatty, A. G.
Bechtelheimer, A. E. (Ret.) (Hon.)
Budzenski, F. N. (Ret.)
Colvin, A. A. (Ret.)
Deno, L. J.
Duchac, J. V. (Ret.)
Duresky, F., Jr.
Enger, E. M.
Freseman, C. J.
Friets, C. G.
Gueller, H. L.
Gunderson, E. (Ret.) (CStPM&O)
Hand, G. W. (Ret.)
Harris, A. R.
Heiszenbuttel, H. (Ret.)
Hillman, F. W. (Ret.)
Hoffman, E. L.
Huffman, W. H.
Johnson, D. H. (CStPM&O)
Johnson, G. C.
Womeldorf, C. F. (Ret.)
Koenig, M. E. (CStPM&O)
Larsen, H. C. (Ret.) (CStPM&O)
Larson, K.
Linn, G. A.
Luck, R. P. (Ret.)
McCosky, L. E.
Madson, H. C. (Ret.)
Malmberg, C. R.
Manning, D. A. (Ret.)
Mead, E. L. (Ret.)
Merwin, P. B. (Ret.)
Meyers, B. R.
Nelson, R. D.
Olson, O. D.
Packard, B. G.
Perrier, J. L.
Riggs, W. K.
Sathre, C. O.
Shanklin, J. F.
Sinclair, C. H.
Thatcher, C. H., Jr.
Thelander, P. V. (Ret.)
Tieman, L. G.
Vandenburgh, E. C. (Ret.) (Hon.)
Wagner, W. R.
Whitehouse, B. M. (Ret.)
Winkelhaus, L. C. (Ret.)



. . . owes its effectiveness to the right combination of chemicals, equipment and service. Look to Nalco for EXPERIENCE, too. Nalco originated H-174, the most powerful, formulated, granular, easy-to-use weed killer marketed today. Available to you are on-track or push cart spreaders for easy application of dust-free Nalco H-174.

For precision application of liquid chemicals along rights-of-way, Nalco provides the most modern spray cars and experienced operating personnel. When you consider weed and/or brush control, consider Nalco — dependable for efficiency and economy-minded know-how.

NALCO CHEMICAL COMPANY

Spray Services Department

6216 West 66th Place • Chicago 38, Illinois
P. O. Box 5444 • Huntington, West Virginia
In Canada: Alchem Limited, Burlington, Ontario

THE Nalco® SYSTEM

SERVING RAILROADS THROUGH PRACTICAL APPLIED SCIENCE

Chicago, Burlington & Quincy (Incl. F. W. & D.)

Bonnevier, C. J.
Bowman, H. A. (FW&D)
Brouse, R. G., Sr.
Brown, E. J.
Budd, R. (Ret.) (Hon.)
Cramer, F. H. (Ret.)
Davidson, J. W.
Hemmer, A. F.
Landstrom, C. A. (Ret.)
Oest, W. C. (FW&D)
Patterson, C. C.
Pearson, A. H.
Seley, L. L.
Skogreen, J. A.

Chicago Great Western

Butterfield, S. E.
Peterson, J. M.
Roof, W. R. (Ret.)
Smith, A. E.

Chicago, Milwaukee, St. Paul & Pacific

Bartlett, E. W.
Bost, M. A. (Ret.)
Bost, M. R.
Bredfeldt, C.
Buford, C. H. (Ret.) (Hon.)
Burch, E. E.
Cameron, W. M.
Celander, H. W.
Cheney, R. R.
Christianson, H. B. (Ret.)
Clark, K. L.
Collings, J. E.
Engman, V. E. (Ret.)
Fisher, D. H.
Frederick, A. H.
Gillette, J. E. (Ret.)
Glander, A. M. (Ret.)
Hansen, A. E.
Hinsch, L. C.
Hodgson, A. W.
Hornig, F. F.
Johnson, B. O.
Johnson, H. I.
Johnson, R. W. (Ret.)
Klouda, R. G.
Koster, K.
Kruse, H. H.
Kvenberg, S. E.
Lucas, H. F.
Lund, C. V.
McCall, H. W.
McGrew, F. O.
Madvig, H. J.
Martin, J. D.
O'Brien, W. J. (Ret.)
Ornburn, B. J.
Ostrom, W. D.
Riffle, L. R.
Saether, A. H.
Simmons, R. G.
Slagle, G. P.
Spinks, W. H.
Stanczyk, W.
Strate, T. H. (Ret.) (Hon.)
Trenning, D. P.
Tyckoson, E. G.
Webber, G. R.
Wilkin, R. L.

Chicago River & Indiana-Indiana Harbor Belt

Smith, C. A.

Chicago, Rock Island & Pacific

Blake, B. D.
Charvat, A. W.
Engle, T. J.
Fetters, R. B.
Franzen, E. T.
Palagi, L. A.
Throckmorton, W. B.
Ware, W.
Williams, J. R.

Cincinnati Union Terminal

Hopton, J. P.

Now! These railroads use
Reflectorized Train Control

with

WIDE ANGLE FLAT-TOP®

REG. U.S. PAT. OFF.

SCOTCHLITE

BRAND

REFLECTIVE SHEETING

- **FOR ECONOMICAL 24-HOUR SAFETY**
- **FOR LOW MAINTENANCE COSTS**
- **FOR LONGER SIGN LIFE**
- **FOR IMPROVED TRAIN CONTROL**

3M COMPANY

The terms "Scotchlite" and "Flat-Top" are registered trademarks of Minnesota Mining & Mfg. Co., St. Paul 6, Minn. General Export: 99 Park Ave., New York 16, N.Y. In Canada: P.O. Box 757, London, Ontario.

Clinchfield

Goforth, J. A.
Hillman, W. C.
Hobbs, J. C.
Salmon, J. M., Jr.

Columbus & Greenville

Lea, E. T.

Delaware & Hudson

*Bowen, R. L.
Connor, J. J.
Crounse, W. E.
Cruikshank, A. W.
Neutts, F. T.
Norris, J. M. W.
Phillips, J. H.
Seely, W. L.
Varker, J. L. (Ret.)
Williams, N. H.

Denver & Rio Grande Western

Adkins, H. O.
Brenton, G. W.
Huntsman, W. J.

Detroit & Mackinac

Campbell, J. G.

Detroit, Toledo & Ironton

Hancock, J. S. (Ret.)
Hynes, E. J.
Moline, R. F.
Towle, C. L.

Duluth, Missabe & Iron Range

Anderson, A. C.

Elgin, Joliet & Eastern

Hopkins, J. M.
Hoyt, A. C.
Johnson, A. C.
Lokotzke, G. P.
McDiarmid, R. J.
Martyn, G. W.
Mateer, W. G. (Ret.)
Skinner, H. E.

Erie

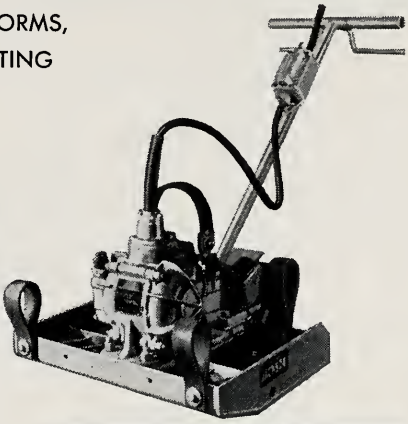
Carpenter, G. B.
Chamberlain, P. C.
Durston, S. G.
Elower, L.
Ferry, M. H. (Ret.)
Holmes, E. J.
Hoza, W. S.
Jentoft, L. H.
Jess, G.
Lichtenberger, F. W.
Luce, W. L.
Petteys, W. F.
Rode, L. A.
Weikal, J. K.
Yaw, D. M.

Florida East Coast

Dysart, C. E.
Taylor F. H.
von Sprecken, R. E.
Welch, J. W.

The JACKSON COMPACTOR

IDEAL FOR BLACKTOPPING PLATFORMS, CROSSINGS & WALKS - COMPACTING GRANULAR SOILS, etc.



The JACKON delivers as many as 4200 THREE-TON blows per minute, is self-propelling and will compact bituminous mixes in 5" layers close to maximum density at the rate of 600 sq. yds. per hour . . . the handiest, most efficient means of blacktopping walks, crossings, drives and consolidating granular soils in subbases, fills, etc. Operates on 110 V, 3-phase, 60 cy. A.C. from commercial source, any Jackson Portable plant, or the Jackson auto-trailer with generator and hydraulic pick-up of Compactor. Write or phone for complete details.

JACKSON VIBRATORS, INC. LUDINGTON MICH. U.S.A.

Galveston, Houston & Henderson

Smith, H. E.

Great Northern

Barke, W. B.
Cheselski, F. S.
Duffy, P. E.
Grieder, R. E.
Hayes, J. W.
Hellickson, D. E.
Hemstad, B. (Ret.)
Jackson, H. O.
Kahl, F. B.
Larson, L. M.
McHaffie, J. N.
McMahon, T. D. (Ret.)
Melton, H. W.
Wiklund, W. W.
Wood, R. E.

Green Bay & Western

Mettlach, P. A.
Zapfe, E. J.

Gulf, Mobile & Ohio

Bober, H.
Bodie, B. V.
Carothers, M. D. (Ret.)
Cooper, S. A.
Erskine, J. A.
Hellweg, R. D.
Martin, W. H.
Rapier, L. F.
Reese, C. L.
Wall, E. G.

Illinois Central

Albert, E. A.
Beringer, M. A.
Block, M.
Burford, A. E.
Cantrell, C. F., Jr.
Croft, P. H.
Frederickson, N. H.
Groner, B. H.
Harper, W. B.
Hoffmann, J. P.
Johnson, E. A.
Johnson, M. (Ret.)
Layman, D. C.
Leach, A. L.
Lingle, T. N.
Little, H. C.
Mottier, C. H. (Ret.)
Myers, R. L.
Owens, B. H.
Parrish, E. L.
Raessler, V. D.
Runde, E. E.
Russell, C. E.
Schlaf, E. R.
Snyder, E. F.
Stinebaugh, J. H.
Tilley, E. L.
White, L. H.

Illinois Terminal

Firehammer, L. M.

Jacksonville Terminal

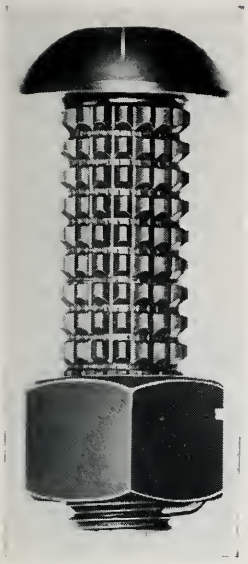
Carr, R. D.
Warrenfells, J. F.

Kansas City Southern—Louisiana & Arkansas

Bolte, W. R. (KCS)
Borchert, W. C. (Ret.) (L&A)
Reece, A. N. (Ret.) (KCS)
Rhodes, O. J. (L&A)

Lake Superior & Ishpeming

Miller, R. H.
Morrison, R. H.



NEW!

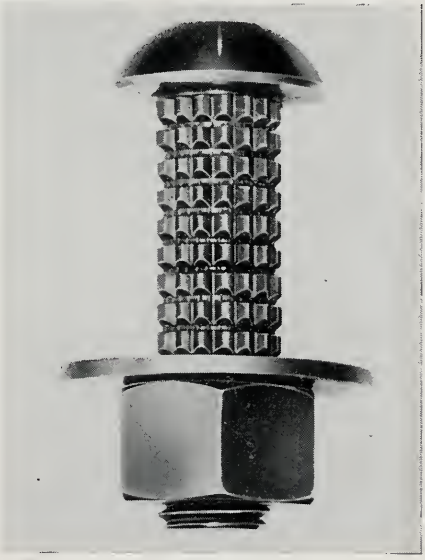
ANCO

HIGH TENSILE

STRUCTURAL RIB BOLTS

For Structural Joints Requiring The Extra Strength Of High Tensile Steel

- Interrupted ribs fill hole to create joint in initial bearing . . . body-bound feature eliminates possibility of joint slippage
- Flat head and tapered ribs permit easy driving . . . ribs do not peel off or pack under head
- Designed with proper rib length . . . full thickness of plates in full bearing . . . no steel rides on threads
- Can be furnished with ANCO Lock Nuts (above) or standard hex nut and washer (right)
- Available in black or hot dip galvanized
- Technical data, price quotations and copy of university test reports upon request



AUTOMATIC NUT COMPANY
INCORPORATED

LEBANON, PENNSYLVANIA

For inquiries and samples write to
R. J. Voss, District Manager, 53 West Jackson Blvd., Chicago 4, Ill.

Lehigh Valley

Rights, H. T. (Ret.)
Wistrich, H. A.

Long Island

Raver, H. E.
Rowland, J. W.
Woodward, J. D.
Wright, C. W. (Ret.)

Los Angeles Junction

Harrison, G. C.

Louisville & Nashville

Bolling, J. P.
Cockerham, E. C.
Currier, L. F.
Forman, H. C.
Fussell, W.
Hotard, A. E.
Lackey, J. B.
McGee, M. A.
Manson, A.
Morris, C. L.
Nichols, J. C.
Pearce, J. R.
Potts, G. W.
Reed, T. C.
Sellers, J. B.
Wilcoxson, W. D.
Williams, L. L.

Maine Central

Born, J. O.
Dixon, C. E.
Lampson, W. (Ret.)

Minneapolis, St. Paul & Sault Ste. Marie

Gannon, J. P.
Krefting, A. S.
Olson, V. E.
Pederson, W. E.

Missouri-Kansas-Texas

Carter, T. S.
Huckaby, V. T.

Missouri Pacific

Anderson, J. L. (Ret.)
Bach, S. A.
Becker, A. L.
Bertel, D. J.
Bunge, W. H. (Ret.)
Burkel, J. N.
Carpenter, R. H.
Chaney, A. B. (Ret.)
Collier, P. B.
Cook, E. F.
Elledge, L. M.
Hampton, A. A.
Huckstep, W. A. (Ret.)
Jackson, S. M.
Kieckers, E. W.
Mack, H. L.
Mason, E. L.
Mayfield, L.
Meeks, W. R.
Schoener, J. T.
Short, W. L.
Smith, G. H.
Sprengel, H. A.
Stadter, C. O.
Starnes, W. B.
Thomason, C. G.
Wachtel, C. D.
Walker, G. P. (Ret.)
Walker, P. M.
Warren, J. A.
Wohlschlaeger, M. A.

Monon

Anderson, M. P.
Baker, R. E.
Wang, A. B.

WHY SWITCH TO LARGER TIE PLATES?

USE
BIRD
Self-Sealing Tie Pads
with smaller plates

Note excellent condition of these ties after 9 years' service on railroad bridge spanning the Ohio River at Louisville, Kentucky. 7½" x 10" tie plates were installed with *Bird Self-Sealing Tie Pads* when ties were new in 1948. Vulnerable underplate and spike hole areas are in as good condition today as they were 9 years ago. (Photos courtesy of Kentucky & Indiana Terminal Railroad.)

Here's conclusive proof that smaller tie plates, used with Bird Self-Sealing Tie Pads, carry the load satisfactorily while affording better protection than larger tie plates without pads. This bridge installation, on a 6° curve, is subjected to the heavy tonnage of three railroads. After nine years of service, Bird Self-Sealing Tie Pads are still firmly sealed to the tie. The vulnerable underplate and spike-hole areas of the ties are in as good condition as the day they were installed. Moisture and abrasive materials could not penetrate the effective seal of the pad to the tie.

So why switch to larger tie plates? Instead use Bird Self-Sealing Tie Pads with smaller plates for longer tie life. For informative booklet, containing facts and figures on actual dollar savings, write to Bird Tie Pads, East Walpole, Massachusetts.

Buy the Best . . . BIRD & SON, inc. Established 1795 *Buy BIRD*

Monongahela Connecting

LeDonne, J. A.

National Railways of Mexico

Piccone, C. (Ret.)

New Orleans Public Belt

Garland, E. F.

New York Central
(Incl. C. C. C. & St. L.—C. R. & I.—I. H. B.—M. C.)

Anderson, A.
Bird, H. F.
Davis, H. E.
Deal, C. D.
Defendorf, C. E.
Dimick, C. A.
Fobes, E. E. (Ret.)
Gilmore, J. M.
Heuss, C. W. (Ret.) (CCC&StL)
Hickok, B. M.
Lawrence, E. J.
McCauley, M. L.
Moutoux, H. G., Sr.
Nelson, M. S.
Nies, A. B. (Ret.) (MC)
Ovardits, K.
Patterson, J. A.
Robinson, G. E.
Smith, C. A. (CR&I-IHB)
Sparks, F. P.
Taggart, C. R. (Ret.)
Tattershall, E. R. (Ret.)
Weeks, A. H.

New York, Chicago & St. Louis

McKenney, C. E.
Merrill, B. W.
Milne, A. P.
Moris, R. F.
Singer, E. W. (Ret.)

New York, New Haven & Hartford

Bassinger, F. O.
Gillis, A. D. (Ret.)
Jenkins, H. W.
Kenyon, J. R.
McKay, A. G. (Ret.)
Meeker, G. W.
Smith, C. E. (Ret.)
Tetrault, L. J. (Ret.)

Norfolk & Western

Chaffin, E. S.
Hosp, W. B.
Shamblin, R. E.

Norfolk Southern

Boling, E. C.
McIver, J.

Northern Pacific

Barhan, L. M.
Grant, A. F.
Humphreys, R. W.
Morris, C. R.
Panushka, E. A.
Peterson, H. R.
Savage, F. E.
Wiemer, H. C.
Wold, O. R.

Modern bridge foundations call for Armco Foundation Pipe ...you can inspect them AFTER DRIVING

Increasing highway construction has made the grade separation structure an important part of today's planning. With both railroads and highways having a vital share in these structures, more and more foundation specifications read "Armco Foundation Pipe."

Long, straight-driving lengths of Armco Pipe Piles have been proved in service. Engineers prefer them because they are easily inspected for alignment and watertightness *after* driving. Contractors like the uniform roundness that makes splicing quick and easy. For dimensions and physical properties, write for your copy of folder, "Armco Foundation Pipe." Welded Pipe Sales Division, Armco Drainage & Metal Products, Inc., 6490 Curtis Street, Middletown, Ohio.

ARMCO DRAINAGE & METAL PRODUCTS

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company • The Armco International Corporation • Union Wire Rope Corporation

Ontario Northland

Saunders, T. D.

Pennsylvania

Abel, N. M.
Atkinson, T. J.
Barranco, S. J.
Beckert, R. C.
Blake, J. E., Jr.
Bowman, R. M.
Bradfield, R. G.
Brandimarte, J. J., Jr.
Campbell, H. G., Jr.
Chamberlain, H. L.
Clarke, R. J.
Creek, C. W.
Dal Cerro, N. J.
Day, F. D.
Dick, H. M. (Ret.)
Dunlop, A. R., Jr.
Flayhart, W. H.
Gottsabend, W. J.
Harman, C. A.
Hendrix, W. P.
Herbort, W. F.
Jawor, J. J.
Johns, D. H.
Jorlett, J. A.
Kemmerer, W. G. (Ret.)
Kendall, J. T.
Langan, G.
Laurick, M. J.
McKibben, D. H.
Mathias, H. O.
Mays, J. W. N.
Meredith, W. E.
Montague, C. F.
Moore, J. D.
O'Keefe, F. J.
Pahl, W. H., Jr.
Parvin, C. F.
Piper, J. F.
Potts, H. F.
Prentiss, E. W.
Rapant, F.
Richards, C. A. J. (Ret.)
Rouse, D. I.
Rudisill, D. E.
Saurer, D. E. (Ret.)
Seltzer, J. W.
Sempsrott, D. A.
Sharkey, J. J. (Ret.)
Shultz, E. R.
Smith, R. H., Jr.
South, J. E.
Stillson, J.
Todd, D. C.
Von Behren, G.
Walker, S. C.
Warfield, H., Jr. (Ret.)
Warfield, W. B.
Wilson, H. M.
Wintoniak, S. G.

Pittsburg & Shawmut

Weaver, W. R.

Port Terminal

Bogle, W. H.

Quebec, North Shore & Labrador

Hurley, G. L.

Reading

Hinkel, E. H.
Klein, C. A.
Siegfried, F. A.
Templin, R. S.

Richmond, Fredericksburg & Potomac

Doggett, T. S.

Sacramento Northern—Tidewater Southern

Moser, C. A.

DOUBLE EXTRA HEAVY

HAND-MADE TACKLE BLOCKS

- Steel Blocks for wire cable.
- Wood Blocks for Manila rope.

W. W. PATTERSON COMPANY

830 Brocket Street, N.S. Pittsburgh 33, Pa.

ROBERT W. HUNT COMPANY

Engineers

INSPECTION — TESTS — CONSULTATION

Cement, Concrete, Chemical, Metallurgical and Physical Laboratories

Inspection and Tests of Structural Steel, Reinforcing Steel and Cement

Supervision of Construction and Field Inspection of Steel and Concrete Structures

Inspection and Tests of Bridge Machinery

Supervision of and Qualification of Welders

Resident Inspectors at the Larger Manufacturing Centers

San Francisco
Los Angeles
Portland
Seattle

General Offices and Laboratories
810 South Clinton Street, Chicago 7

St. Louis
Birmingham
New Orleans
Philadelphia

Pittsburgh New York London

St. Louis-San Francisco

Bunch, A. H.
DeMate, M. A.
Fort, O. E.
Holt, C. V.
Jenkins, R. W.
*Langston, J. H.
Latimer, J. A.
Leak, V. L. (Ret.)
McDonald, J. W.
Matthews, H. A.
Meeth, P. W.
Nichols, R. E.
Payne, G. C.
Richardson, F. L.
Sanderson, J. G.
Walker, D. L.
Wallace, C. E. (Ret.)
White, R. D.

St. Louis Southwestern
(Incl. St. L. S. W. of T.)

Alley, F. T.
Eble, A. E.
Lowry, J. M.
McGrew, B. H.
Parker, W. V. (Ret.)
Patterson, R. H.
Simmons, E. R.

St. Paul Union Depot
(Minn. Trans.)

Podas, N. F. (Ret.)

Seaboard Air Line

Beam, Y. C.
Billingsley, C. C.
Bishop, I. A.
Caldwell, F. O.
Collum, R. L.
Conner, L. E.
Eargle, J. M.
Hutto, J. E.
Inabinet, J. V.
Jones, A. C., Jr.
Martin, J. W.
Moore, G. A.
Witherspoon, J. P.

South Buffalo

Dalziel, H. M.

Southern
(Incl. G. S. & F.)

Beaver, J. F.
Cary, N. M.
Cothran, R. F.
DeValle, J. W.
Dysinger, M. A.
Fondren, R. W.
Foster, C. B.
Fox, R. L.
Hall, J. H. (GS&F)
Hiner, J. T.
Jones, A. C. (Ret.)
Kelly, J. R.
Lane, J. R.
McElreath, C. S.
McPherson, J. W.
Messman, D. V.
Midkiff, R. B.
Moore, H. R.
Moreland, H. B.
Moser, C. L.
Newlin, C. H.
Roberts, J. T.
Rothell, R. D.
Rust, R. B., Jr.
Sarris, P. T.
Smith, E. L.
Taylor, W. L.
von Sprecken, T. M.
Wall, R.
Watkins, J. F.
Zimmerman, C. B.

The

PENETRYN SYSTEM

Inc.

Restoration and Protection of Masonry

•

SHOTCRETE RESTORATION OF PIERS, ABUTMENTS, DAMS and TUNNELS

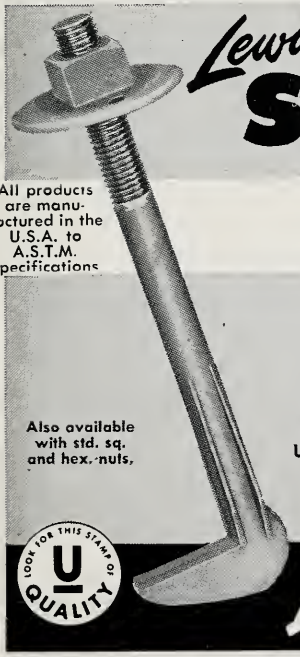
•

PRESSURE GROUTING OF MASONRY and FOUNDATIONS

•

ALL PHASES OF PRESSURE CONCRETE CONSTRUCTION

Albany Cleveland



Lewis sealtite

hook bolt

All products are manufactured in the U.S.A. to A.S.T.M. specifications

A highly dependable, superior bolt used in bridge and trestle construction. Forged from S.A.E. 1045 steel. Patented fins prevent turning. Sealtite washer nut adds strength, stops seepage. *Available in Hot-Dip Galvanized finish for greater durability and economy.*

Also available with std. sq. and hex. nuts.

Used by 85% of America's Class I Railroads

See your Lewis representative, or contact factory for samples, prices, full details.

LOOK FOR THIS STAMP OF U QUALITY

Lewis BOLT & NUT COMPANY
504 Malcolm Ave. S. E.
MINNEAPOLIS 14, MINNESOTA

Southern Pacific
(Incl. N. W. P.—P. E.—S. D. & A. E.—T. & N. O.)

Baker, F. A.
Billings, C. N. (T&NO)
Black, A. R. (T&NO)
Brown, G. W. (T&NO)
Calhoun, F. B. (T&NO)
Camelle, E. J. (T&NO)
Clouette, H. F. (NWP)
Cooledge, V. R.
Crane, J. C.
David, J. J. (T&NO)
Eichenlaub, C. M. (SD&AE)
Erickson, O.
Fuller, T. L. (T&NO)
Gladwin, F. E. (NWP)
Gogl, E. U.
Haase, E. H.
Hagenmaier, C. E.
Harman, W. C. (Ret.)
Harwood, M. S. (Ret.)
Hefte, A. (NWP)
Helmle, C. E. (T&NO)
Hostetter, R. A. (T&NO)
Howard, W. A. (T&NO)
Hunt, H. A. (T&NO)
Hutchings, V. W.
Jackson, T. E.
Jarratt, M.
Kelly, G. E.
Lehman, H. G.
Loggins, L. A. (T&NO)
Lynch, J. F., Jr.
Lyon, L. E.
McCormick, K. L. (PE)
McDermott, A. A.
Manley, B. F. (Ret.) (PE)
Matthews, W. L.
Morgan, C. E. (T&NO)
Mouhout, P. T. (Ret.) (T&NO)
Neal, C. E. (NWP)
Odgers, F. T.
Peffly, J. E. (Ret.) (PE)
Peterson, J. C.
Pfeiffer, A. B.
Phillips, W. J. (Ret.)
Prober, H. W.
Prude, G. F. (T&NO)
Pruett, J. A. (T&NO)
Rainey, W. H. (T&NO)
Reynolds, M. L.
Rintoul, D. T. (Ret.)
Robinson, N. R.
Safley, J. R.
Shaw, J. E. (T&NO)
Shobert, F. (Ret.)
Sladecek, B. F. (T&NO)
Smith, J.
Smith, L. L.
Stephens, B. M., Jr. (T&NO)
Stutes, S. A. (T&NO)
Tange, M. (T&NO)
Tardy, F. E.
Tracy, D. E.
Trulove, J. D.
Tucker, N. R. (Ret.) (T&NO)
Vandiver, V. J.
Wade, E. B. (T&NO)
Weatherly, H. E. (T&NO
White, S.

Spokane International

Simonson, E. F.
Williams, J. B.

Terminal Railroad Association of St. Louis

Bowman, J. R.
Bruns, M. W.
Ingram, J. L.
McMillen, J. W.

Texas & Pacific

Fronabarger, H. C. (Ret.)

Texas City Terminal

Wray, H. O. (Ret.)

Texas Mexican

Cornett, B. J.
Mason, S. K.

Toledo, Peoria & Western

Patterson, C. A.

Engineers' & Contractors' Directory

The Arundel Corporation

BALTIMORE 2, MD.

DREDGING

ENGINEERING CONSTRUCTION

SAND GRAVEL STONE

BLAST FURNACE SLAG

PRE-MIXED CONCRETE

Bolton Gunite Contractors, Inc.

Cement Gun Construction

7255 N. Harlem Ave. Rodney 3-7010 Chicago 48, Ill.

Cayuga Construction Corporation

Contractors and Engineers

30 Vesey Street, New York 7, N. Y.

Union Pacific

Bateman, E. F.
Batey, W. A. (Ret.)
Best, R. A.
Crawford, C. M.
Fairchild, E. H.
Hogel, E. C.
McMann, J. B.
Schweitzer, E.
Smedley, V. N.
Stephen, T. J.
Tyler, W. R., Jr.
Weyand, J.

Union Terminal

Steel, J. V.

Virginian

Carter, J. W.
Gabrio, C. W.

Wabash

Fritzinger, G. F.
Hamilton, C. W.
Harding, W. G.
Hedley, W. J.
Huntsman, F. C. (Ret.)
Malone, J. W.

Western Maryland

Billmeyer, E. D.
Dahlberg, A. R.
Derryberry, J. T.
Diehl, C. M.
Etchison, F. L.
George, S. W.
Gunderson, R. R.
Phillips, L.

Western Pacific

Burner, P. D.
Campbell, J. E.
Carlson, A. W.
Cox, R. C.
Crespo, M. J.
Elliott, C. E.
Forseth, C. E.
Howard, J. G.
Hutchinson, D. G.
Nordstrom, R. D.
Sullivan, P.
Switzer, G.
Woolford, F. R.

OTHER AFFILIATIONS

Burpee, C. M., American Wood Preserving Institute
Dick, M. H., Railway Track & Structures
Dove, R. E., Railway Track & Structures
Flanagan, F. L. (Ret.), Valspar Corporation
Gehrke, E. G., American Railway Engineering Association
Harding, C. R. (Ret.), Pullman Company
Hodgkins, E. W., Jr., Railway Track & Structures
Howard, N. D. (Hon.), American Railway Engineering Association
Howard, P. D., Minnesota Mining & Manufacturing Company
Lacher, W. S. (Ret.), American Railway Engineering Association
McDaniel, W. L. (Ret.), American-Marietta Company
Morgan, L. R., Association of American Railroads
Myers, E. T., Modern Railroads
Toh, J. S., Stud., Lehigh University
Tourtellotte, E. B., Consulting Engineer

Compliments of

CODELL CONSTRUCTION CO.

Railroad & Heavy Construction

P O Box 17 **Winchester, Ky.**

J. L. DICKSON

PUBLIC WORKS CONSULTANT

342 W. Woodlawn — San Antonio, Texas

EDWARD E. GILLEN COMPANY

Bridges-Docks-Piers and Pile Driving of all types

218 West Becher St. Milwaukee 7, Wis.

DAVID W. GODAT & ASSOCIATES

Consulting Engineers

816 Howard Ave. **New Orleans 12, La.**

GRADE SEPARATIONS, BRIDGES, BUILDINGS, HIGHWAYS

MODJESKI & MASTERS

Consulting Engineers

Bridges, Structures and Foundations

Forster at Sixth
P. O. Box 167
Harrisburg, Pa.

Broad-Lacust Bldg., Philadelphia, Pa.
2400 Canal St., New Orleans, La.

Morrison-Knudsen Company, Inc.

Contractors and Engineers

Main Office at Boise, Idaho

ASSOCIATION OF TRACK AND STRUCTURE SUPPLIERS

Achuff Railway Supply Co.
Aeroquip Corporation
Air Reduction Sales Co.
Airstream Trailers, Inc.
Aldon Company, The
Allied Chemical Corp.
Allis Chalmers Mfg. Co.
Amchem Products, Inc.
American Brake Shoe Co.
American Concrete Crosstie Corp.
American Hoist & Derrick Co.
American Nut & Bolt Fastener Co.
American R.R. Curvelining Corp.
Arcair Company
Armco Drainage & Metal Products Co.
Athey Products Corp.
Austin-Western Const. Equip. Div.
Baldwin-Lima-Hamilton Corp.

Barber-Greene Co.
Bernuth, Lembcke Co., Inc.
Binks Manufacturing Co.
Bird & Son, Inc.
R. H. Bogle Co.
Briggs & Stratton Corp.
Buckeye Iron & Brass Works
F. Burkart Mfg. Co.

Caterpillar Tractor Co.
Chicago Pneumatic Tool Co.
Chipman Chemical Co., Inc.
Cleveland Frog & Crossing Co.
Clinton Engines Corp.
Colorado Fuel & Iron Corp.
Conley Frog & Switch Co.
Continental Motors Corp.
W. T. Cox Co., Inc.
Cullen-Friestedt Co.

Daubert Chemical Co.
Dearborn Chemical Co.
Dow Chemical Co., The
E. I. du Pont de Nemours & Co., Inc.
Duff-Norton Co., The

Eaton Manufacturing Co. — Reliance Div.
Elliott Manufacturing Co.
Enterprise Railway Equipment Co.

Fabreeka Products Co.
Factory Products Co.
Fairmont Railway Motors, Inc.
Foundation Equipment Corp.

Gandy Wagon Co.
Geigy Agricultural Chemicals
Goodyear Tire & Rubber Co.
Gorman-Rupp Co., The
Gray Company, Inc.
Greenville Steel Car Co.

Brice Hayes Co., The
Hayes Track Appliance Co.
Houston Co., The
Robert W. Hunt Co.

Industrial Brownhoist Corp.
Ingersoll Rand Co.
International Harvester Co.
Const. Equip. Div.

Jackson Vibrators, Inc.
Johnson Rubber Co.
O. F. Jordan Co.

Kalamazoo Manufacturing Co.
Kasle Steel Corp.
Kershaw Manufacturing Co.
Koehring Div. of Koehring Co.
Kohler Co.
Koppers Co., Inc., Wood Pres. Div.

LFM Mfg. Co., Inc., The
Lehon Company
LeRoi Div. — Westinghouse Air Brake Co.
Linde Co. — Div. Union Carbide Corp.
Link-Belt Speeder Corp.

Mahon, R. C. Co.
Maintenance Equipment Co.
Matisa Equipment Corp.
McKiernan-Terry Corp.
Mid-West Forging & Mfg. Co.
Minnesota Mining & Mfg. Co.
Missco Transportation, Inc.
Modern Railroads
Modern Supply Co.
Moore & Steele Corp.
Morrison-International Corp.
Morrison Railway Supply Corp.
T. J. Moss Tie Co.
Motorola Communications & Electronics, Inc.
Murdock Manufacturing & Supply Co.

National Aluminate Co.
National Cylinder Gas-Div. of
Chemetron Corp.
National Lock Washer Co., The
National Torch Tip Co.
Nolan Co., The
Nordberg Manufacturing Co.
Northwestern Motor Co.

D. W. Onan & Sons, Inc.

P & M Co., The
Permacrete Products Corp.
Permali, Inc.
Pettibone Mulliken Corp.
Philadelphia Steel & Wire Corp.
Pitman Mfg. Co.
Plasser Railway Machinery
Pocket List of Railroad Officials, The
Pullman-Standard Manufacturing Co.

Q & C Company, The

Racine Hydraulics & Machinery, Inc.
Rail Joint Co., The
Rail Service Corp.
Railroad Rubber Products, Inc.
Rails Company, The
Railway Ballast Conditioning Corp.
Railway Maintenance Corp.
Railway Track-work Co.
Reade Manufacturing Co., Inc.
Remington Arms Co., Inc.
Ridge Tool Co., The

Schield-Bantam Co.
Schramm, Inc.
Simmons-Boardman Publishing Corp.
Southern Amiesite Asphalt Co.
Frank Speno Ballast Cleaning Co., Inc.
Sperry Rail Service
Spray Products Corp.
Superior Combustion Industries, Inc.

Tamper Limited
Teleweld, Inc.
Templeton, Kenly & Co.
Texaco, Inc.
Thermex Metallurgical, Inc.
Track Specialties Co., Inc.
True Temper Corp.

Union Switch & Signal Div.
Westinghouse Air Brake Co.
Unit Rail Anchor Corp.
U. S. Borax & Chemical Corp.

Vulcan Materials Co.

Warner & Swasey Co.
Wasco Supply Co.
Wellman Engineering Co., The
Western Railroad Supply Co.
White Manufacturing Co.
Wisconsin Motor Corp.
Woodings-Verona-Tool Works
Woolery Machine Co.
Youngstown Sheet & Tube Co., The

Sebastian Corporation

Contractors

414 Detering **Houston, Texas**

SVERDRUP & PARCEL ENGINEERING CO.

ENGINEERS-ARCHITECTS

915 OLIVE STREET ST. LOUIS 1, MO.

Talbott Construction Corporation

Railroad Grading, Track Laying &
Bridge Construction

Telephone No. PIoneer 4-4412

P. O. Box 231 Winchester, Ky.

BIBLIOGRAPHY OF CONTENTS

of Proceedings of

the

American Railway

BRIDGE & BUILDING

Association

1943-1959

(No Proceedings published in 1944 and 1945)

VOLUME 50 (1943)

Committee Reports:

Carrying Over Bridges and Trestles (H. T. Livingston, Chm)
Maintaining Coal and Sanding Plants (A. L. McCloy, Chm)
Materials—Relief Through Substitutes (W. A. Sweet, Chm)
Men—How to Secure and Hold (M. D. Carothers, Chm)
Revising Work Practices to Eliminate Traffic Interference (L. R. Lamport, Chm)
Salvaging Bridge, Building and Water Service Materials (H. Wuerth, Chm)
Securing Maximum Utilization of Work Equipment (D. T. Rintoul, Chm)

VOLUME 51 (1946)

Committee Reports:

Adapting Turntables to Meet Modern Conditions (H. M. Harlow, Chm)
Cause and Prevention of Injuries (H. D. Curie, Chm)
Developments in Use of Off-Track Equipment (F. R. Spofford, Chm)
Improving Strength, Durability and Wear Resistance of Concrete (J. S. Hancock, Chm)
Methods of Cleaning Water Lines, Sewers and Drains (W. D. Gibson, Chm)
Servicing Facilities for Diesel Locomotives (B. R. Meyers, Chm)
Tools and Equipment for Bridge and Building Shops (H. E. Davis, Chm)
Utility and Economy of Prefabricated Buildings (A. G. Dorland, Chm)

VOLUME 52 (1947)

Committee Reports:

Construction and Maintenance of Shop and Enginehouse Floors (R. W. Gilmore, Chm)
Development and Training of Supervisory Personnel (F. W. Hutcheson, Chm)
Economies Derived Through Modernization of Water Stations (H. E. Graham, Chm)
Glued, Laminated Members in Bridges (Lee Mayfield, Chm)
Inspection of Substructures and Underwater Foundations (L. D. Garis, Chm)
Safety Measures to Protect Employees Within Buildings (S. L. Chapin, Chm)
Unfilled Needs in Power Machines and Tools for B&B Work (R. W. Johnson, Chm)
Utilization of New Types of Material in Buildings (B. M. Stephens, Chm)

VOLUME 53 (1948)

Committee Reports:

Eliminating Waste of Water (E. R. Schlaf, Chm)
Enlarging and Relining Tunnels for Present-Day Traffic (C. M. Eichenlaub, Chm)
Fuel Oil Storage and Servicing Facilities (H. E. Michael, Chm)
Good Housekeeping to Promote Safety and Fire Prevention (H. E. Skinner, Chm)
Housing Bridge and Building Employees (W. W. Caines, Chm)
Protection to Bridges Over Navigable Streams (A. E. Bechtelheimer, Chm)
Sanitary Facilities for Railway Buildings (L. C. Winkelhaus, Chm)
Types of Bridges for Replacing Timber Trestles (F. M. Misch, Chm)

VOLUME 54 (1949)

Committee Reports:

Disposal of Liquid Waste at Engine Terminals (J. A. Jorlett, Chm)
Fire Protection for Bridges and Trestles (L. R. Morgan, Chm)
Installation and Maintenance of Built-Up Roofing (W. H. Bunge, Chm)
Modern Methods for Watering Passenger Coaches (W. D. Gibson, Chm)
Pier Construction and Maintenance at Waterfront Terminals (F. W. Hutcheson, Chm)
Prevention and Removal of Corrosion From Steel Structures (W. C. Harman, Chm)
Prolonging Life of Ties on Bridges and Trestles (H. D. Curie, Chm)
Safety in Transportation of Men and Materials (J. M. Giles, Chm)

VOLUME 55 (1950)

Committee Reports:

External Protection From Corrosion for Pipe Lines (H. E. Graham, Chm)
How to Sell Accident Prevention (E. H. Blewer, Chm)
Maintenance of Low-Level Passenger Platforms (L. C. Winkelhaus, Chm)
Mechanization and Specialization of Forces (R. R. Gunderson, Chm)
Precast Concrete Piles in Bridge and Pier Construction (J. F. Warrenfells, Chm)
Treated Lumber in Building Maintenance and Construction (R. W. Cassidy, Chm)
Waterproofing on Ballast-Deck Bridges (F. J. A. Leinweber, Chm)

VOLUME 56 (1951)

Committee Reports:

Accident Prevention in Maintenance and Use of Work Equipment (R. L. Fox, Chm)
Construction of Diesel Fueling Facilities (K. E. Hornung, Chm)
Developments in Use of Laminated Timbers (G. W. Benson, Chm)
Effects of 40-Hour Week (F. W. Hutcheson, Chm)
Fire Protection of Bridges, Trestles and Culverts (T. E. Jackson, Chm)
Maintenance and Operation of Heating Plants (V. E. Engman, Chm)
Materials for Building Exteriors (B. M. Stephens, Chm)
Protection of Steel Bridges Against Brine Drippings (M. J. Hubbard, Chm)

VOLUME 57 (1952)

Committee Reports:

Developments in Power Tools and Machines (J. T. Hiner, Chm)
Fire Prevention Through Regular Inspections (H. B. Lorence, Chm)
Inspection and Maintenance of Water Tanks (J. H. Stinebaugh, Chm)
Maintenance of Track Scales (C. W. Laird, Chm)
Present Trends in Modernizing Passenger Stations (W. F. Armstrong, Chm)
Repairs to Steel Bridges and Structures (G. W. Benson, Chm)
Restoring and Prolonging Life of Masonry Structures (B. C. Phillips, Chm)
Safety Problems of the Supervisor (G. Switzer, Chm)

VOLUME 58 (1953)

Committee Reports:

Conversion of Shop Buildings for Diesel Maintenance (W. F. Armstrong, Chm)
Furnishing Water Under Emergency Conditions (E. R. Schlaf, Chm)
Modern Machines and Power Tools in Bridge Maintenance (J. M. Lowry, Chm)
Programming Repairs and Replacements (J. J. Healy, Chm)
Rejuvenation of Safety Meetings (M. Jarratt, Chm)
Selection and Training of B&B and W.S. Personnel (J. M. W. Norris, Chm)
Ventilation and Air Conditioning of Railway Buildings (W. H. Bunge, Chm)

VOLUME 59 (1954)

Committee Reports:

Adaptation of Water Service Facilities to Dieselization (R. H. Bush, Chm)
Cleaning and Painting of Railroad Buildings (W. L. Short, Chm)
Fireproofing of Timber Bridges (C. E. Elliott, Chm)
Inspection, Repair and Replacement of Culverts (M. D. Carothers, Chm)
Metal Fasteners in Wood Construction (G. W. Benson, Chm)
Organization for Restoration of Flood Damage (E. L. Collette, Chm)
Trends in Modernization of Freight Stations (R. C. Baker, Chm)
Tunnel Maintenance (Shirley White, Chm)

VOLUME 60 (1955)

Committee Reports:

Construction and Maintenance of Roadway Signs (F. W. Hutcheson, Chm)
Heating and Ventilating Diesel Shops (D. E. Perrine, Chm)
New and Improved Tools for B&B Work (R. L. Fox, Chm)
Sanding Facilities for Diesel Locomotives (R. H. Patterson, Chm)
Trends in B&B and Water Service Organizations (V. D. Raessler, Chm)
Use of Special Bolts in Structural Steel Work (H. M. Dick, Chm)
Welding—Applications to B&B Work (E. M. Cummings, Chm)

VOLUME 61 (1956)

Committee Reports:

Advancements in Protective Coatings for Railway Structures (W. L. Short, Chm)
Coach Watering Facilities Must Be Sanitary (C. B. Foster, Chm)
Moving B&B and W.S. Gangs Over the Highway (J. L. Perrier, Chm)
Prefabricated Buildings Versus Other Types (H. A. Matthews, Chm)
The Slow Order and Bridge Maintenance and Construction (T. M. vonSprecken, Chm)
The Supervisor—His Records, Accounts and Cost Information (R. H. Miller, Chm)

VOLUME 62 (1957)

Committee Reports:

Branch Line Bridges and Buildings and Their Maintenance (W. F. Petteys, Chm)
Let the Motto Be Always Safety First (R. D. Hellweg, Chm)
Maintenance of Automotive and Maintenance of Way Equipment (E. F. Garland, Chm)
Mechanization, Tools and Equipment (H. O. Adkins, Chm)
Utilities of Ready-Mixed, Precast and Prestressed Concrete in B&B Work (F. D. Day, Chm)
What Should the Supervisor Expect from Management and Vice Versa?
(N. H. Williams, Chm)

VOLUME 63 (1958)

Committee Reports:

Bridge and Building Forces and the Federal Highway Program (M. J. Hubbard, Chm.)
Dieselization and the Water Service Man (J. H. Stinebaugh, Chm.)
Extended Service Life for Masonry Structures (O. E. Fort, Chm.)
Housing Problems of Bridge and Building Forces (H. M. Wilson, Chm.)
Trends in Trestle Design and Construction (J. A. Goforth, Chm.)
Attracting and Training B&B People (R. D. Bisbee, Chm.)

VOLUME 64 (1959)

Committee Reports:

Contracting Work in the B&B Department (W. W. Caines, Chm.)
Effect of Preventive Maintenance on Work Equipment (R. H. Miller, Chm.)
Materials and Methods for Extending the Life of Existing Structures
(J. F. Warrenfells, Jr., Chm.)
New Materials for Buildings (G. F. Prude, Chm.)
Recent Developments in Fire Protection Methods (R. D. Hellweg, Chm.)
Use of Highway-Railway Equipment by B&B Forces (A. W. Carlson, Chm.)

Engineers: Parsons, Brinckerhoff, Quade & Douglas

TORRINGTON BEARINGS CUT OPERATING POWER 60%

. . . *save on first cost and maintenance*

Sixteen specially designed Torrington Bearings are installed on the main sheaves of the world's longest vertical lift bridge, the Arthur Kill Railroad Bridge linking New Jersey and Staten Island, N. Y. Result is a 60% reduction in the operating force required with substantial savings in size and cost of motors and mechanical equipment. Greatly reduced maintenance and power costs will provide additional savings throughout the life of the bridge.

Torrington engineers have been cooperating with bridge designers for more than a quarter of a century . . . developing bearings outstandingly successful in raising efficiency and cutting costs on all types of movable span bridges. This wealth of experience is ready to serve you on any modern anti-friction bearing problem. For information on how Torrington bridge bearings can help you, call or write: The Torrington Company.

Prominent Bridges Equipped with TORRINGTON BEARINGS

Arthur Kill Railroad Bridge.....1959
Wabash Railroad Bridge, Valley City, Ill. 1959
Turtle River Bridge, Brunswick, Ga..1956
South Park Avenue Bridge, Buffalo, N. Y.....1955
North State Street Bridge, Chicago, Ill. 1949
The Canal Street Bridge, Chicago, Ill. 1948
San Joaquin River Bridge, Mossdale, Calif. 1948
The Commodore Schuyler F. Heim Bridge, Los Angeles, Calif.....1947
Lake Washington Floating Bridge, Seattle, Wash. 1940
Lewiston-Clarkston Bridge, Washington-Idaho Border 1939
Torrence Avenue Bridge, Chicago, Ill.....1936
Cape Cod Canal Bridge, Buzzards Bay, Mass. 1935

progress through precision **TORRINGTON BEARINGS**

THE TORRINGTON COMPANY South Bend 21, Ind. • Torrington, Conn.